JULY, 1940 CIRCULATION OF THIS ISSUE—IN EXCESS OF 14,000 COPIES 25c

BETTERING PREDICTED PERFORMANCE—

Equipped with American Hammered Piston Rings

With the lines of a yacht and the cargo capacity of the most practical freighter, the Mormacpenn was the first of the new C-3 vessels off the ways. Designed to be one of the finest, fastest cargo vessels on the seven seas, the ship exceeded expectations in performance; the anticipated speed of 16.5 knots was easily upped, in the test runs, to 19.7 knots.

Four Busch-Sulzer Diesel Engine Company's standard diesels drove the ship to this record. Rated capacity is 8500 SHP at 85 RPM, with a continuous overload capacity of 10%. These engines, as well as those used in three sister ships, are all factory-equipped with American Hammered Piston Rings.

America's leading builders of Diesel Engines are all extensive users of American Hammered Piston Rings. Several have standardized on the Gold Seal, which has proven itself the ideal solution to the ring problems that today's more powerful diesels have introduced. These rings are especially valuable for replacement, as engines can be put under load immediately without the usual hazard of scuffing and scoring. Our Piston Ring Handbook gives the story.

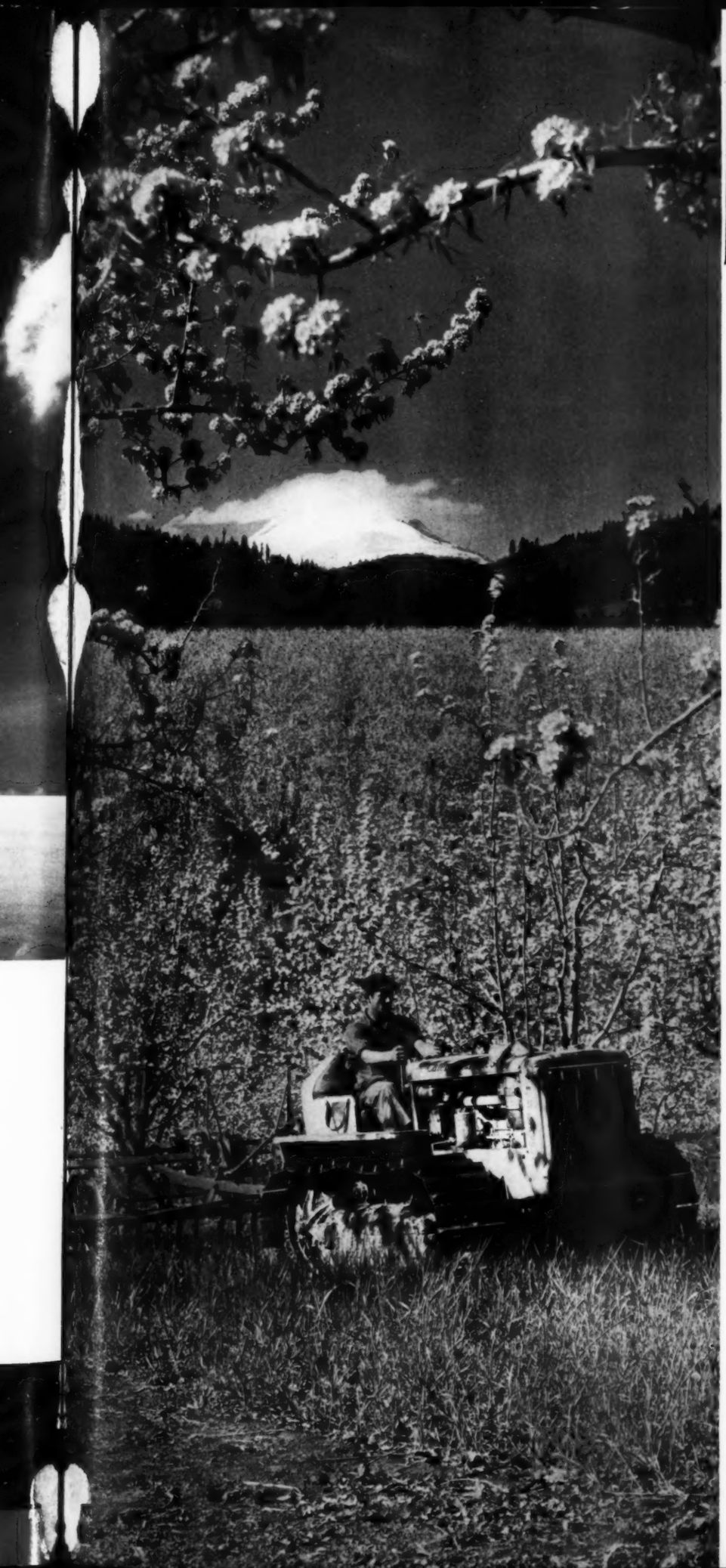
Design and Operating Engineers can obtain a copy of our Piston Ring Handbook by writing . . . on company letterhead.

KOPPERS COMPANY · AMERICAN HAMMERED PISTON RING DIVISION · BALTIMORE, MD.

OTHER KOPPERS PRODUCTS: Coal . . . Coke . . . Fast's Couplings . . . Treated Timber, Poles, and Piling . . . Waterproofing . . . Built-up Roofs . . . Materials Handling Systems . . . Special Machinery

American Hammered Piston Rings

a KOPPERS product



DIESEL PROGRESS and DIESEL AVIATION

JULY

FRONT COVER ILLUSTRATION: The 1025 hp. Rathbun-Jones Diesel engine installed in the plant of the New England Spun Silk Corporation. See detailed article on pages 22 and 23 of this issue.

TABLE OF CONTENTS ILLUSTRATION: Caterpillar Diesel tractor pulling a John Deere cultivator in a 400 acre pear and apple orchard of the Mt. Adams Orchard Company, Husum, Washington. It covers 45 acres in ten hours on 1.3 gal. of fuel per hour.

DIESEL PROGRESS for July, 1940, Vol. VI, No. 7. Published monthly by Diesel Engines, Inc., 2 West 45th St., New York, N. Y. Tel. MUrray Hill 2-5092. Subscription rates: U.S.A. and Possessions, $3.00 per year; 25c per copy. All other countries, $5.00 per year; 50c per copy.

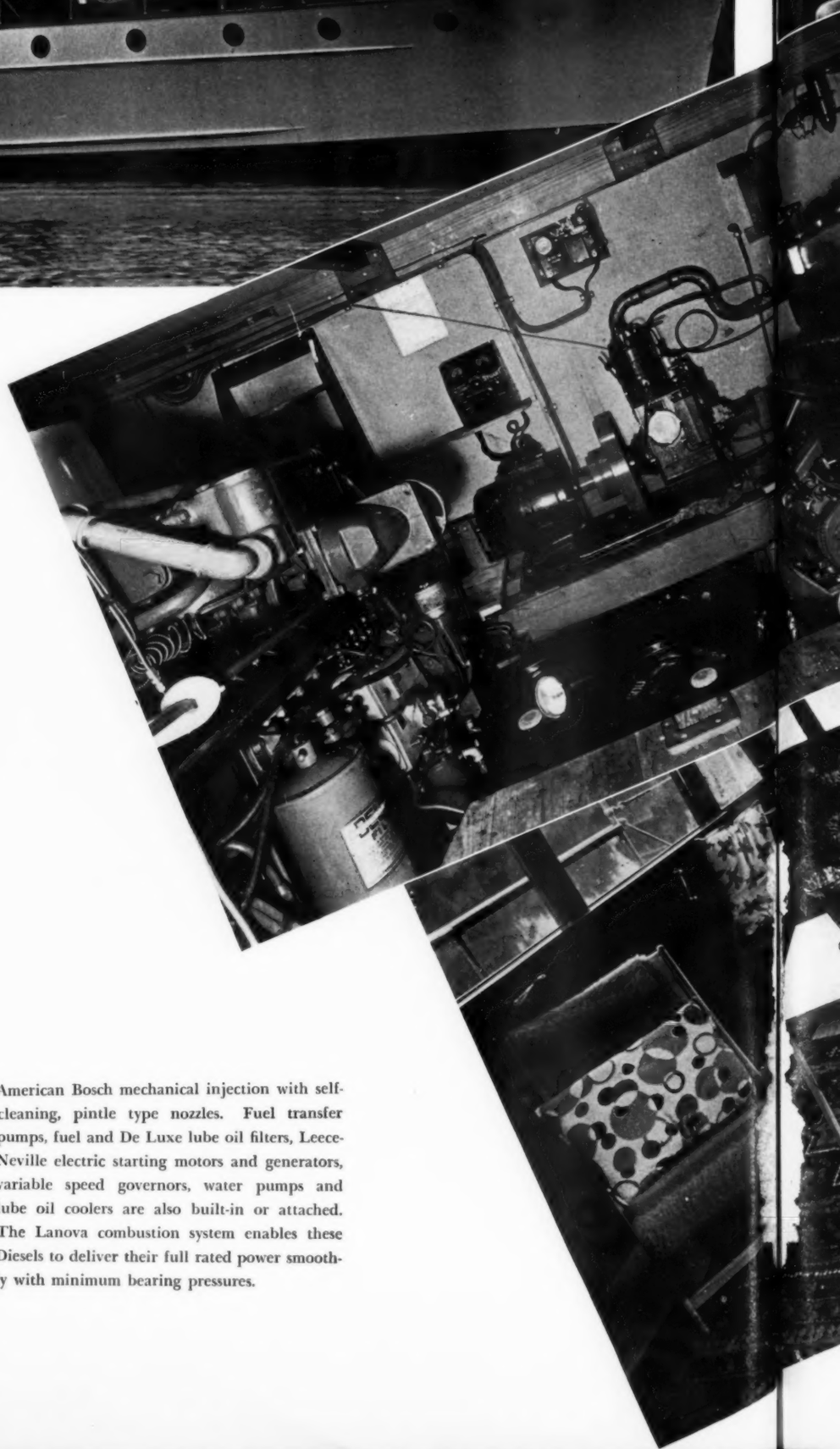
REX W. WADMAN
Editor and Publisher

HEYWORTH CAMPBELL
Art Director

CCA

PAUL H. WILKINSON
Aviation Editor

he 56 ft. Diesel Windboat "Annanetta" on the Thames River.



"ANNANETTA"

By WILL H. FULLERTON

REPUTED to be the last Diesel yacht completed before the outbreak of hostilities abroad is the *Annanetta*, a 56-ft. Windboat, powered with a pair of 110 hp. Buda-Lanova Diesels, built by Graham Bunn at Wroxham, England and sold by Arthur Bray, Buda distributor in London. Finished early in September, 1939, she was brought by her owner from Yarmouth to the Thames after the war had actually started. Born with the war, as she was, it may be hoped the *Annanetta* will bring her owner many pleasant, peaceful hours, at least, after the duration.

She is of hard chine construction having a length of 56 ft. a beam of 13 ft. 3 in. and a draft of 4 ft. 11 in. The pair of Buda-Lanova Diesel propulsion engines are rated at 90 to 110 hp. each at 1,500 to 2,000 rpm. These engines are 4½ in. bore, 5½ in. stroke with built-in Joe's reverse and 2 to 1 reduction gears, American Bosch mechanical injection with self-cleaning, pintle type nozzles. Fuel transfer pumps, fuel and De Luxe lube oil filters, Leece-Neville electric starting motors and generators, variable speed governors, water pumps and lube oil coolers are also built-in or attached. The Lanova combustion system enables these Diesels to deliver their full rated power smoothly with minimum bearing pressures.

Above: The spacious wheelhouse with complete navigating and maneuvering equipment. Left: The pair of Buda-Lanova Diesel main engines with the Stuart Diesel generating set center. Below: The deck saloon, located amidships, looking aft.

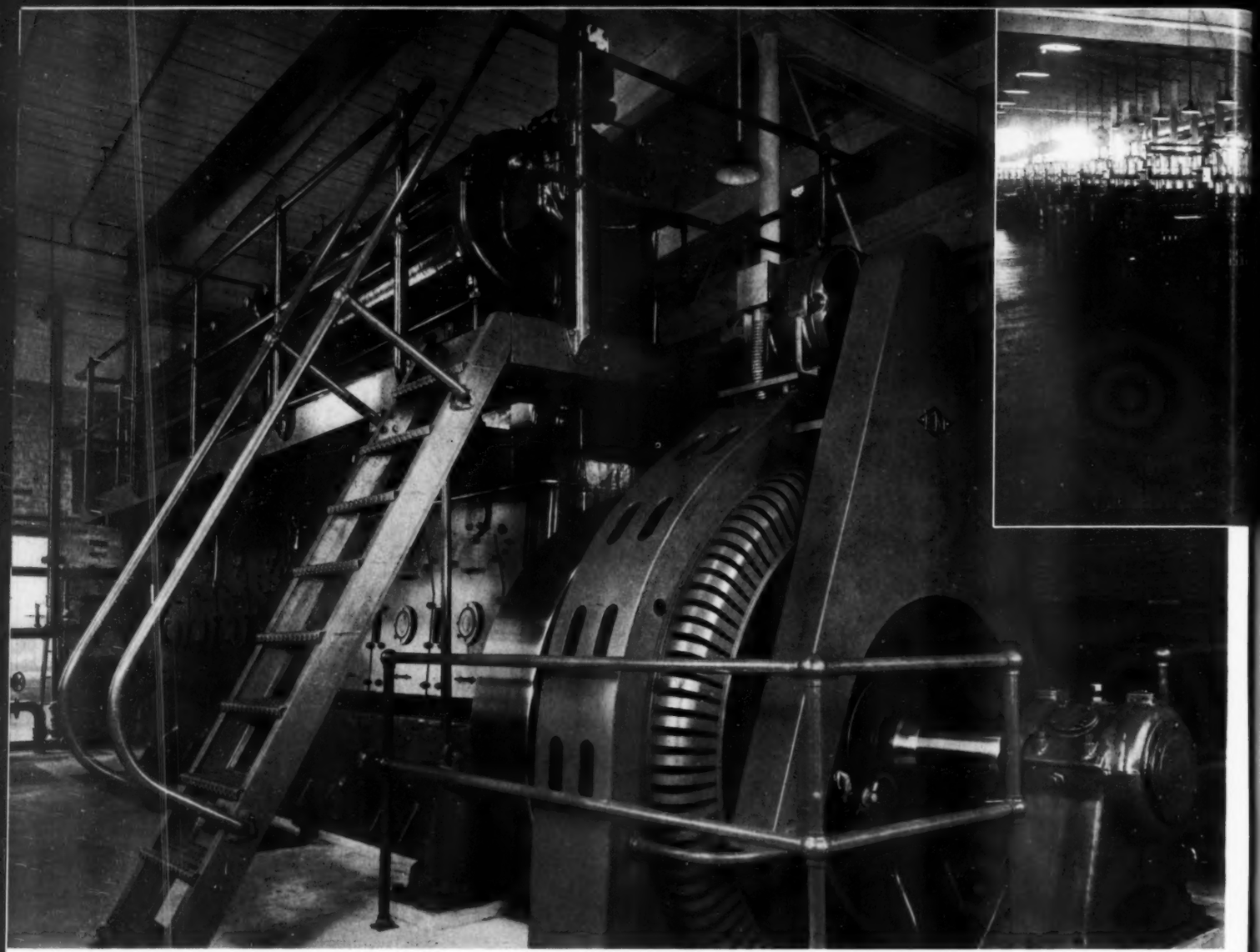
With her engines turning at 1,200 rpm. continuously during the 14 hours voyage from Yarmouth to Canvey she averaged a bit over 14 knots. Her design calls for a maximum of 11¾ knots.

Transmission of noise and vibration to the accommodations is effectively eliminated by mounting both the propelling machinery and generating set on Silentbloc flexible mountings. The tail shafts are driven through Silentbloc flexible couplings which also absorb the thrust.

The *Annanetta* is rich in interesting details of construction and fitting. Her owner, being an electrical engineer, gave full play to his ideas on electrical equipment. This includes an electric cooker, refrigerator, radiators, water heater, pumping system, vacuum cleaner and iron. A 1½ kw. Stuart Diesel generating set is installed in the engine room for charging the 52 cell Exide battery of 220 ampere hours capacity. A 100 volt circuit is provided for power requirements and a 24 volt circuit is employed for lighting and some of the minor electrical equipment. The battery is divided into 24 volt sections each of which may be charged separately, there being an automatic switch fitted to change over the charging circuit as soon as one section of the battery is fully charged. Lighting circuit fuses are fitted in duplicate to prevent light failure in the event one fuse is blown. Wiring to the navigation lights is also in duplicate. Especial attention was given to the elimination of internal magnetism by the simple expediency of so arranging the cables in the wheelhouse as to neutralize their magnetic effect. An interesting protective measure is introduced in the form of thermocouples connected to warning lights on the instrument panel to indicate overheating of the tailshaft bearings.

The forward accommodation includes a single berth forecastle, galley, and two berth guest cabin, with the dining saloon immediately aft The owner's full-width stateroom, finished in mahogany and panel board, a bathroom and work room comprise the after accommodation. Amidships is the spacious wheelhouse and deck saloon, the latter being over 12 ft. long. She carries an 11 ft. 9 in. dinghy powered with a 9/16 hp. Gray Marine engine.

At present, the *Annanetta* is tied up in the upper Thames with her owner and his wife at home aboard. She is, however, worthy of the open sea where she may roam when the vicissitudes of war have passed. She is indeed a well planned, sturdily constructed and beautifully appointed craft.



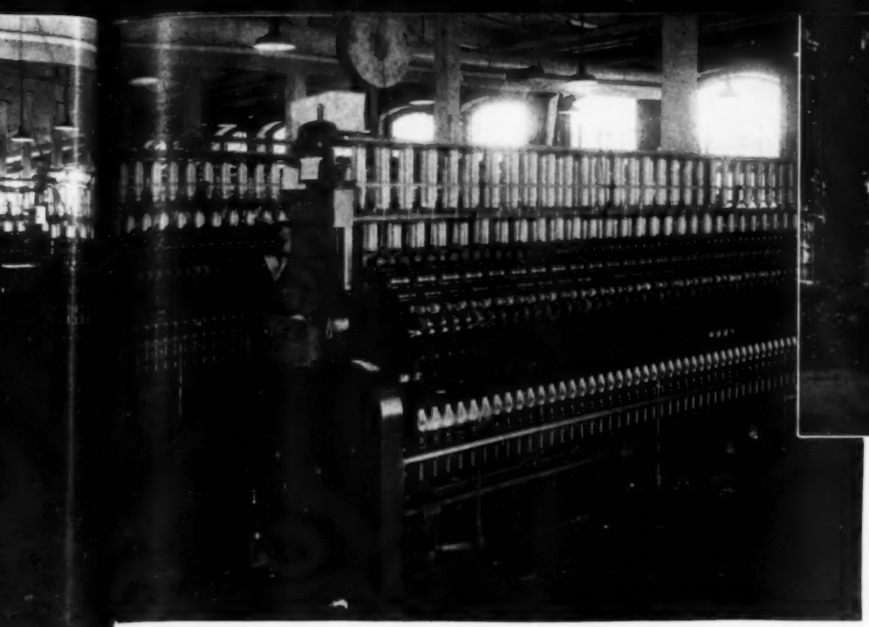
View from the switchboard of the 1025 hp. Price-Rathbun Oil Engine installed at the Brighton, Massachusetts, plant of the New England Spun Silk Corporation. Note the Pickering isochronous governor and Weston cylinder thermometers at the top of the engine.

DIESELS SPIN SILK

By DWIGHT ROBISON

THE front cover illustration of this issue features one of New England's most recent and largest industrial Diesels. Situated at the Brighton, Massachusetts, plant of the New England Spun Silk Corporation, it represents a particularly interesting application of this modern power source to one of the world's most ancient crafts. The outstanding economy and dependability of Diesel-generated power have resulted in its use in practically every kind of manufacturing, but this unit adds a new chapter to the fascinating and profitable story of Diesels by serving an industry that originated in China over 4000 years ago, when the Empress Si-Ling-Chi first domesticated silkworms and discovered the secret of unwinding their cocoons. Although, in the mind of the average person, there can be little, if any, connection between dainty silk fibres and this massive 1000 hp. Diesel engine, the desirability of such a combination became increasingly obvious to the executives of this company as the solution to the problem of reducing operating costs. The results of their careful investigation are graphically shown by the accompanying illustrations. Savings of fifty percent or more of previous purchased power expense are indicated from their survey and actual engine operation since March 1, of this year, according to Chief Engineer Albert Goodhauser.

The generating unit selected is an eight cylinder Price-Rathbun Oil Engine rated at 1025 hp. at 277 rpm., built by the Rathbun-Jones Engineering Corporation. It is directly connected to a 700 kw. Electric Machinery Manufacturing Co. alternator with the exciter mounted on top of it and V-belt driven from

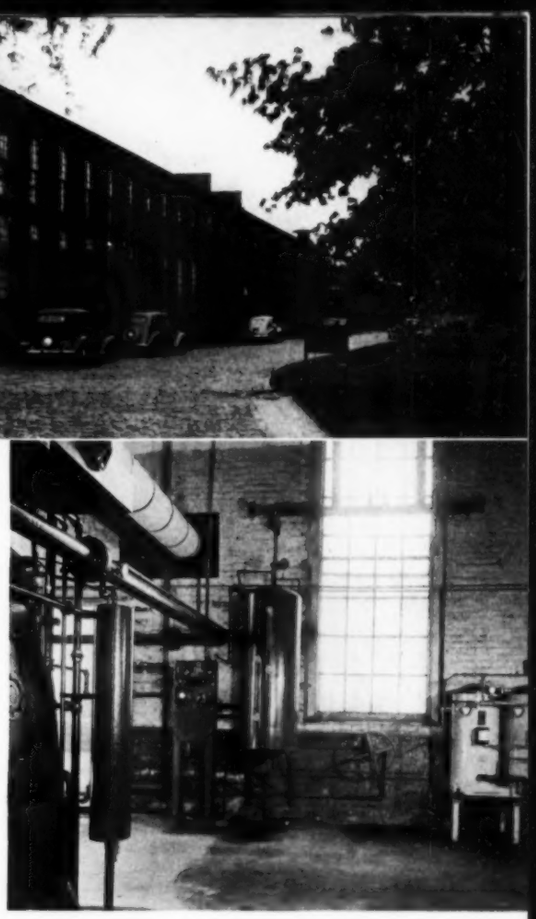


A section of the spinning floor at the New England Spun Silk Plant.

the main shaft, which ends in an outboard bearing. Due to the greater economy of installing a single unit compared with smaller, multiple engines and the further considerations of an extremely safe load factor and dependable performance records of this slow speed, heavy duty Diesel, it was decided to concentrate all generating capacity with no provision for standby or emergency power. This action was taken advisedly and is a splendid tribute to the success of modern Diesel engineering. The engine has ample capacity for all power demands and during most of the operating periods is not required to carry full rated load, leaving plenty of reserve. A 15 kw. utility service is retained for lighting during night periods and weekends when the engine is idle. This current also operates an electric clock and the close regulation of engine speed by means of a Pickering governor is indicated by the parallel operation of a similar clock connected to the independent circuit.

Engine-mounted auxiliaries include Cuno lubricating oil and fuel oil filters, a Weston thermometer on each cylinder, and a Friez (Bendix type) cooling water temperature alarm. Other equipment consists of a Ross Cooler for piston cooling oil, a Cycoil type American air intake filter, Maxim exhaust silencer and Binks cooling tower, the three latter elements being located outside at the rear of the power house. Lubricating oil is constantly reclaimed by means of a Skinner Purifier connected to the lube oil day tank which by-passes to this unit as the oil is circulated from the engine's dry sump. A Midget Levelometer gives instant and convenient readings of cylinder cooling water level in the pit. Starting air is stored in four Scaife steel flasks and supplied by a motor-driven Ingersoll-Rand compressor. For emergency service, a Wisconsin single cylinder gas engine can be connected and hand-cranked. Thus, starting air is always assured.

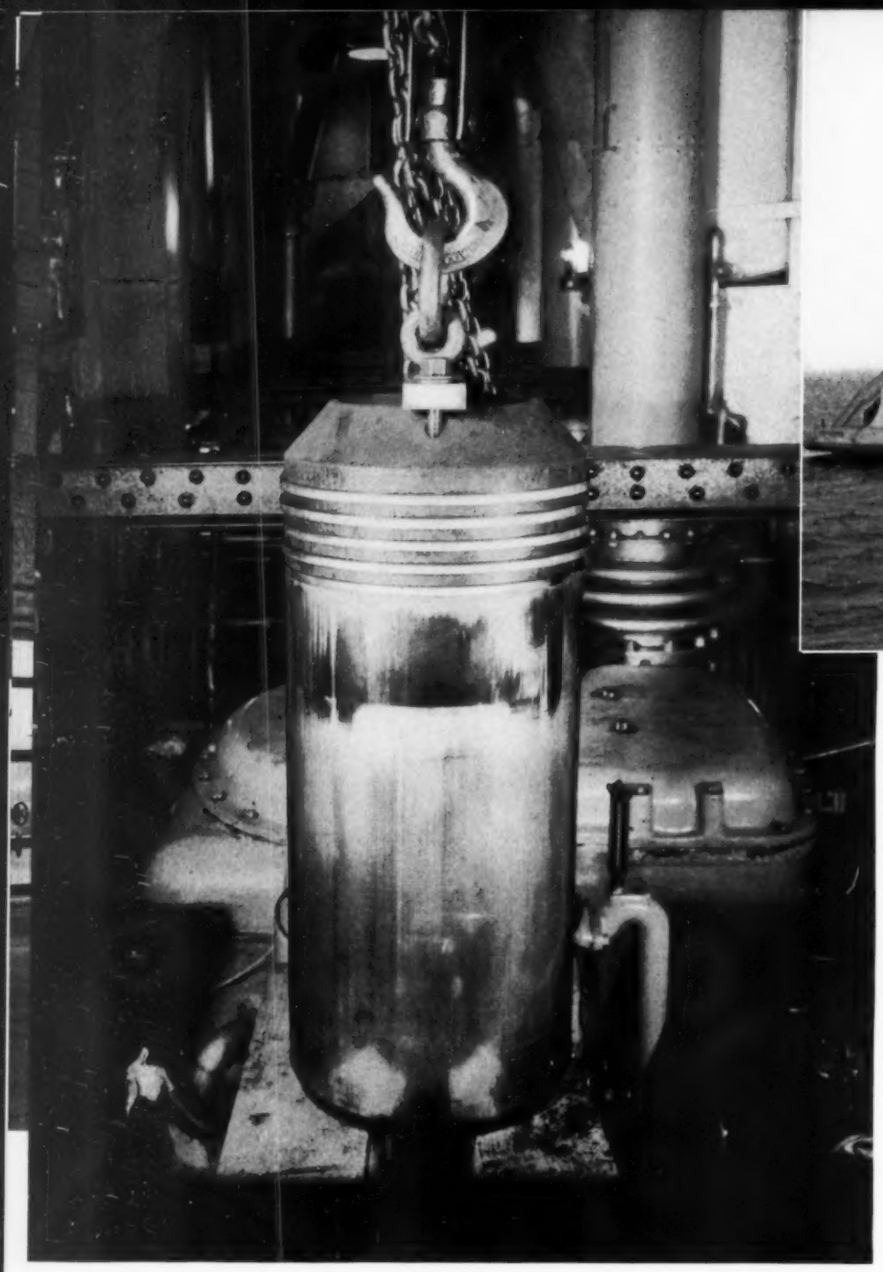
The spinning plant proper employs an average of about 350 workmen, whose duties include preparing the silk, combing it and tending the spinning machines. There is little demand for process steam and the vast amount of intricate machinery is all motor-driven. Despite the fact that there are only four or five such companies in the United States, this country produces approximately one fifth of the world's supply of spun silk. Other staples such as rayon, wool and combinations to produce fancy yarns are also handled. The New England Spun Silk Corporation was established in 1920 and occupies the buildings of an old cordage company. Beautiful ivy-covered red brick walls testify to their age of over 100 years. The spinning floors are quietly busy with none of the bustle usually associated with quantity production, and the endless rows of spindles seem almost super-human in their precision. Only one section of the spinning floor is shown by the illustration yet it serves amply to demonstrate the tremendous demand for smooth, dependable and, above all, economical power. It is the responsibility of this one Diesel to supply spun silk and other staples to weavers of satin, velvets, shirtings, underwear and dress-goods, and a considerable quantity is used in electric wire insulation. Naturally, power constitutes a major item of expense and a reduction of over one half of this cost is of the greatest importance to the management. Since silk spinning requires considerably more delicate machinery than wool or cotton, due to the fineness of silk fibres, the cost of spun silk is



Top: One of the 100 year old buildings, occupied since 1920 by the New England Spun Silk Corporation. Lubricating oil from this large Diesel is reclaimed constantly by a Skinner Purifier as shown above.

correspondingly higher, and such substantial savings at the source of power contribute materially in meeting competition to natural silk in the form of synthetic fibres now being offered to the market.

It may be of interest as a further indication of the benefits to our economy of Diesel-generated power to examine briefly the facts behind so basic and important an industry. When one considers that approximately twenty-five percent of raw silk fibre unreeled from a cocoon is waste unless processed in a plant of this type, the true importance of low costs in such production becomes apparent. In connection with national defense, which is now to the fore, spun silk is used extensively in the form of cartridge bag cloth (for firing large calibre guns) and finds a ready market in the manufacture of parachutes. By means of spinning short fibres it is possible to utilize silk from pierced, incomplete and weak cocoons and waste from reeling and weaving processes that would otherwise constitute prohibitive rejections. As the Diesel enters yet another field of our industrial life it increases still further our productivity and national wealth through conservation of fuel, added efficiency and independence of power source.



This 130 ft. steel ferry boat carries a total of 1680 Diesel horsepower.

DIESEL WEAR REPORT

By WILL H. FULLERTON

View showing piston after 10,500 hours of service.

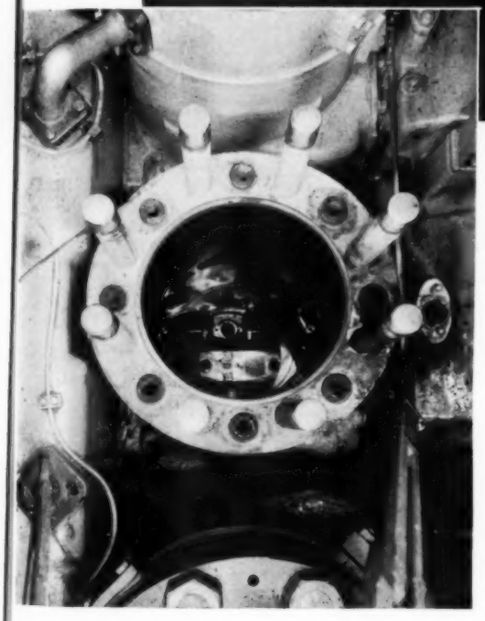
THE Claiborne-Annapolis Ferry Company of Annapolis, Md., operates the Diesel Ferry Boats "John M. Dennis" and "Gov. Harry W. Nice" across Chesapeake Bay between Annapolis and Matapeake. It maintains rigid day and night hourly schedules the year 'round and there are many winter days when ice conditions in the bay call for better than top-rated output of the Diesel propulsion engines.

The "John M. Dennis," powered with end-to-end Fairbanks-Morse, six cylinder, 16" x 20", 840 hp. at 250 rpm., marine Diesels entered service June 15, 1929. The "Gov. Harry W. Nice," with one Fairbanks-Morse, 8 cylinder, 1400 hp., direct reversing marine Diesel, entered service May 12, 1938. Neither boat has ever lost a trip through engine trouble—a performance record which is a credit to both original engine design and intelligent maintenance. The latter consists of regular routine inspection and a thorough annual check up.

This year we were invited to witness the yearly check-up of the "John M. Dennis" Diesels; an opportunity which we welcomed in the hope of presenting a departure from the usual new-installation reports for the readers of DIESEL PROGRESS. The findings of this inspection are offered as tangible evidence of the long-lived qualities of Diesel engines and as an interesting study of certain maintenance factors which preserve this inherent durability.

In March 1937, nearly eight years after the "John M. Dennis" went into service, her two Diesels were renewed down to the beds. Since then, the engines have averaged 3500 operating hours per year or a round total of 10,500 operating hours for the three years up to this inspection. Each piston, when pulled, was found to be smooth and bright below the fire belt and all rings were free. All of these rings are American Hammered. On the Annapolis engine, however, the top ring and bottom rings are Gold Seal, with plain rings between. On the Matapeake engine the two top rings are Gold Seal, the other three are plain. No rings have been replaced in three years, but this year the two top rings are being replaced on both engines.

View from the Matapeake end of the "John M. Dennis." The gentleman is Mr. P. M. Reed, Superintendent Engineer. Note Briggs Clarifier on post, center.



View looking down a cylinder barrel after 10,500 hours of service.

The main bearings now in these engines are the original equipment. Inspection of them showed need for small adjustment and the fact that these bearings will be good for many years was proven by a wear down and deflection check also removing them from the engine. Cylinder wear, the vital factor in engine life, was determined by measurement of each cylinder at the top, half way down, and just above ports on fore and aft diameters and athwartships diameters, giving six readings in each cylinder or a total of thirty-six cylinder measurements on each engine. This inspection was made by representatives of the U. S. Naval Engineering Experimental Station and the American Hammered Piston Ring Company working independently. Since a slight but consistent difference showed throughout the readings obtained, only the averages of the two overall results are shown below to avoid multiplicity of figures:

Annapolis Engine		
Total Wear	Av. Per Cyl.	Av. Per 1000 Hrs.
0.1311″	0.00435″	0.00122″
Matapeake Engine		
Total Wear	Av. Per Cyl.	Av. Per 1000 Hrs.
0.119″	0.00331″	0.000935″

The "John M. Dennis" operates on a shuttle basis, never turning around. For this reason, her engines are designated as Matapeake and Annapolis, since both ends of the boat are always pointed in the one direction. When either engines are required for propulsion, one pushes and the other pulls.

Lube oil in the main engines, as well as the two Fairbanks-Morse Diesel auxiliary generating sets, is Standard of New Jersey Diol-65. As to maintenance of lube oil, Mr. M. P. Reed, Superintendent Engineer of the Claiborne-Annapolis Ferry Company, says, "Oil has been conditioned at a cost of 3 1/3 cents per gallon based on make-up oil used, against refill cost. Same oil is in the third year of use without change. Lube oil consumption averages from 3500 to 4000 hp. hours per gallon."

The supply lines to the cylinder, force feed lubricators on each of the main Diesels, the main lubricating system, and the auxiliary Diesel lubricating systems are fitted with Briggs Clarifiers. In this connection, Mr. Reed says, "cost per mile of fuel and lube oil has been reduced four cents since the installation of this oil maintenance equipment."

To sum up, when these engines are reassembled after the annual check-up, Mr. Reed knows they are fit for another year of trouble free service; he knows that his maintenance schedule is keeping them fit.

MINNEAPOLIS CHAMBER OF COMMERCE BUILDING USES DIESELS

By R. D. CAMPBELL *and* F. R. DALY*

"I HEAR a great deal about Diesel engines these days, but who is using them besides a few railroads and contractors?" This same question, with slight variations, is heard frequently when business men get around to discussing technical and scientific subjects. It is a logical question, for we have all heard about the great strides made in the development of the Diesel engine, but very few laymen realize the widespread use and popularity of the Diesel. It is also a high tribute to the success of the Diesel—for such a question shows that the Diesel is, as a rule, quietly tending to its own business and doing a good job of it.

A typical example of a Diesel engine installation which is doing a good job quietly and without attracting attention is located in the basement of the Chamber of Commerce Building in Minneapolis, Minnesota. Like many another office building, the basement is well fitted with pumps, boilers, compressors, refrigerating equipment, and other machinery required to supply the services for a modern office building. The feature of this particular installation is that all electric current requirements for the building are generated in the basement of the building, and that there is no stand-by connection with the utilities power service.

The history of this plant dates back to 1904 when it operated as an isolated plant with two vertical two-cylinder Westinghouse steam engines supplying all of the electric current for the buildings. Steam from the engines was used to heat one building by direct radiation. From 1904 to 1908, the main building was heated by indirect radiation, employing a duct system, which accounts for the excessive coal consumption, shown on the chart, from 1904 to 1908. The accompanying chart shows the total fuel for heating the building and generating power, reducing purchased current, coal, and fuel oil to equivalent pounds of coal for each year from 1904 to date. During this interval of time (35 years), there were four additions to the buildings, resulting in an increased building volume from 3,320,000 to 4,690,000 cubic feet, an increase of 41 per cent. Beside heating the increased building volume, there was an increase in kilowatts of electric current of 313% during this same interval of time.

As the reader may question the reason for combining the fuel for heating and lighting the building, it is only necessary to point out that it is difficult to separate these costs accurately when the exhaust steam is used for heating the building. In the same manner, it is quite difficult to say how much credit should accrue to the Diesel engines for heating the hot water used in the building. It is not difficult, however, to appreciate the economy of the over-all picture when there is 41% more building to be heated, and the occupants use over three times as much electric power—and the total bill for combined heating and lighting is 25% less than it was at the beginning of the period!

In 1910, the building management signed a ten-year contract for power requirements with the local utility company. The vertical steam engines, which were only six years old, were destroyed by the power company and the scrap metal was sold for junk. The building was then heated with live steam, and all electric current was purchased under the existing contract. Upon the expiration of this contract, the current was purchased on a yearly contract basis for the next two years, while new steam generators were being installed.

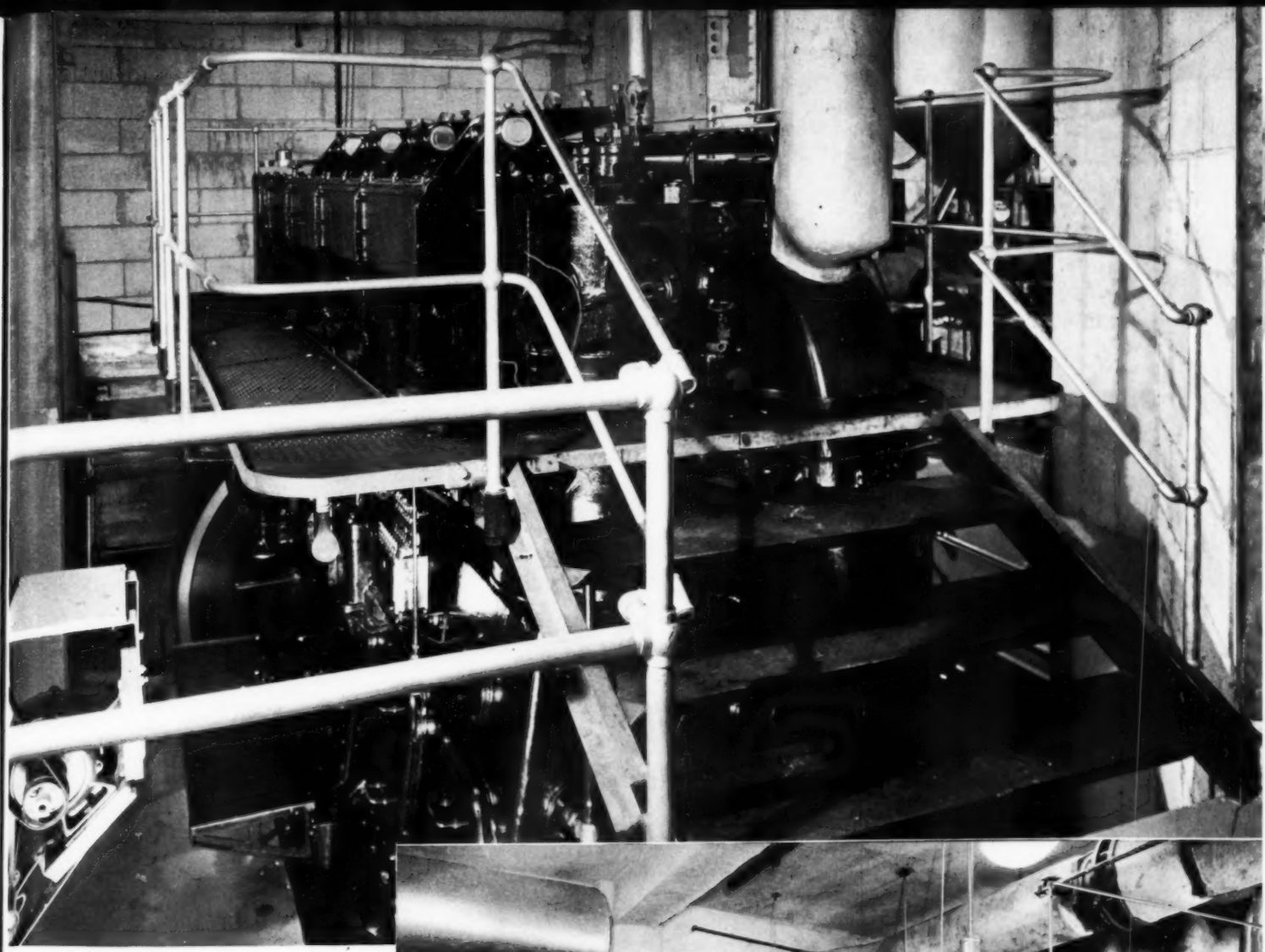
In 1921, two steam engine generator units of 300 kw. and 200 kw. capacity were started, and the utility power purchased for night and Sunday use only. This arrangement continued until 1931 when an additional 400 kw. steam engine generator unit was installed and the utility power contract canceled. Some of you will recall that about this time there was a slight ripple on the sea of prosperity which made business men "economy conscious." Remember it? Then that brings us up to the real point in the story, for the word economy has the peculiar habit of attaching itself to the word Diesel—and they usually make a good team, too.

The first Diesel engine installed in the building power plant was purchased second-hand in 1937 from a firm in Kansas City where the engine had paid for itself in only four years of operation. This unit consists of a four-cylinder, 17½" x 24" Model VA De La Vergne Diesel, running 225 rpm., and rated at 400 hp. The engine is direct connected to a 275 kw., 1100 ampere, 250 volt, 3 wire, compound wound Burke generator. The installation of this engine required an excavation seventeen feet below the basement floor level. After casting the concrete foundation block, the finished level of the engine bay floor was six and one-half feet below the basement floor level.

The engine uses an indirect cooling system in which the jacket water heat is used to preheat water used in the building service. The engine jacket water is circulated by a 2½" centrifugal pump delivering 320 gpm., against 28 ft. total head when turning 1750 rpm. The pump is driven by a 7½ hp. 1750 rpm. General Electric direct current motor.

The engine has a pressure lubrication system for all main and connecting rod bearings, and a Manzel Model Force Feed Lubricator supplies lubricating oil to each cylinder. The lubricating oil is cooled in a Wainwright heat exchanger connected in the pressure lubrication circuit. The oil is cleaned by continually passing a portion of it through a Goulds Hydroil centrifuge which operates at all times

* F. R. Daly, Chief Engineer, Chamber of Commerce Building, Minneapolis, Minnesota.

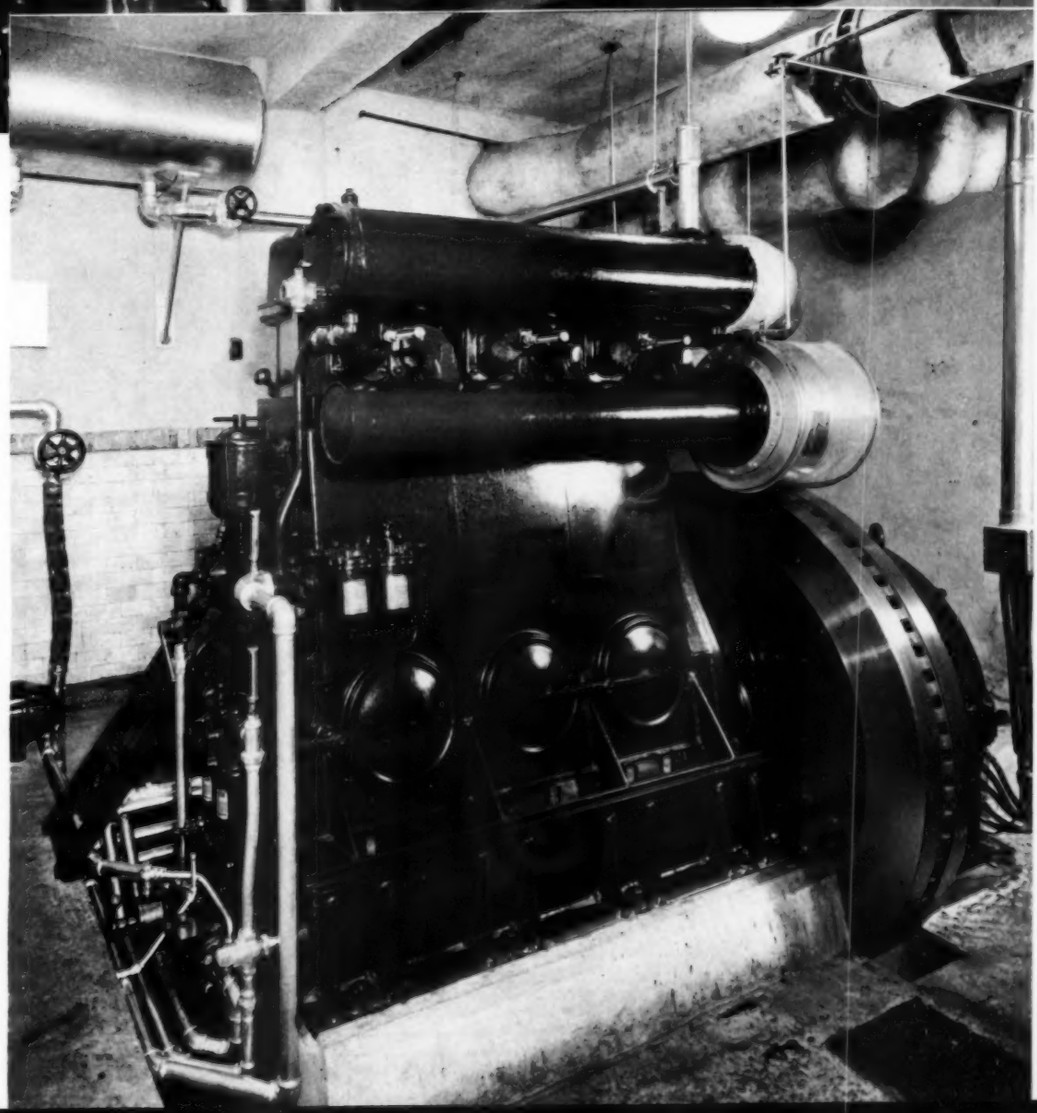


View of the 400 hp. De La Vergne Diesel. Note Motoco jacket water thermometer, top, and Manzel lubricator, left center.

when the engine is running. At regular intervals, a portion of the crankcase oil is withdrawn and run through a De La Vergne lube oil filter for further purification.

The engine is equipped with an Alnor pyrometer for indicating the exhaust gas temperatures of each cylinder. The jacket water circuit from each cylinder has a Motoco thermometer located at a point where the water leaves the cylinder. A two-stage air compressor furnishes the starting air at 220 pounds pressure, which is stored in two 30″ x 108″ welded steel tanks.

The economies effected by the installation of the first Diesel engine in 1937 indicated the



The 3 cylinder, 225 hp., De La Vergne Diesel installed this year. Note Burgess intake filter-silencer above the flywheel, Purolator fuel filters, left center, and lube filters lower left.

advisability of installing another Diesel as the load continued to grow. In October, 1939, a second Diesel generator unit was installed. It consists of a three-cylinder, 12½" x 15½", four-cycle, Model VO De La Vergne engine rated at 225 hp. at 400 rpm. This engine is direct-connected to a 150 kw., 250 v., 600 ampere Burke direct-current generator. The generator is compound wound and equipped with interpoles to improve its electrical characteristics.

The inlet air is drawn through a Burgess air filter mounted directly on the inlet air manifold at a point above the engine flywheel. The exhaust gases are passed through a Burgess Exhaust Snubber for silencing. In place of the conventional exhaust gas pyrometer, each cylinder is fitted with a 100-950°F. exhaust thermometer supplied by the Diesel Plant Specialties Company.

An indirect cooling system is used to cool the engine, and the heat transferred from the engine jacket cooling water is used to preheat the hot water supply of the building. The jacket water is circulated by a Goulds centrifugal pump rated to deliver 90 gpm. at 70 ft. total head. The pump is mounted on the end of a 3 hp., 1750 rpm. Westinghouse, 230 volt D. C. motor. The inlet jacket water temperature is maintained at 120°F., and the outlet temperature averages slightly less than 130°F., which is considered excellent practice for this size of cylinder. Purolator filters are provided in duplicate on both the fuel oil and lubricating oil circuits. The lubricating oil is circulated by a built-in pump which forces the oil through a Schutte & Koerting oil cooler and thence to the parts to be lubricated.

The engine is equipped with American Bosch fuel pumps and injection nozzles. The engine is started with air from the same air tanks used by the large engine. To prevent the transmission of the engine vibration to the building, the engine foundation is set in cork blocks which have proved to be very effective as an isolating or vibration dampening material.

Undoubtedly the feature of this plant is not the physical machinery involved, for it is standard equipment of a well-known make, but the real feature is the economy effected by using a combined steam and Diesel plant to serve a modern building with heat, electric power, and hot water. This combination, which is a completely isolated plant, renders these services in an economical way without interruption. The steam equipment acts as a stand-by for the Diesel, and the Diesel is a stand-by for the steam equipment.

In the winter time when there is an increased demand for heat in the building, the steam engines generate the larger portion of the power and the exhaust steam is used to furnish the building with heat. During any season of the year, it is possible to balance the heating and electric load between the steam and Diesel equipment as there are three steam engines and two Diesel engines, each of different capacities.

The record of this plant is further proof of several points of interest to owners and managers of buildings and city property considering the use of Diesels:

1. A combination steam and Diesel plant has many advantages in supplying the combined services required by a modern office building, hotel, or apartment house.

2. A well-engineered plant may be entirely isolated from outside connections, and still be assured of giving dependable continuous service.

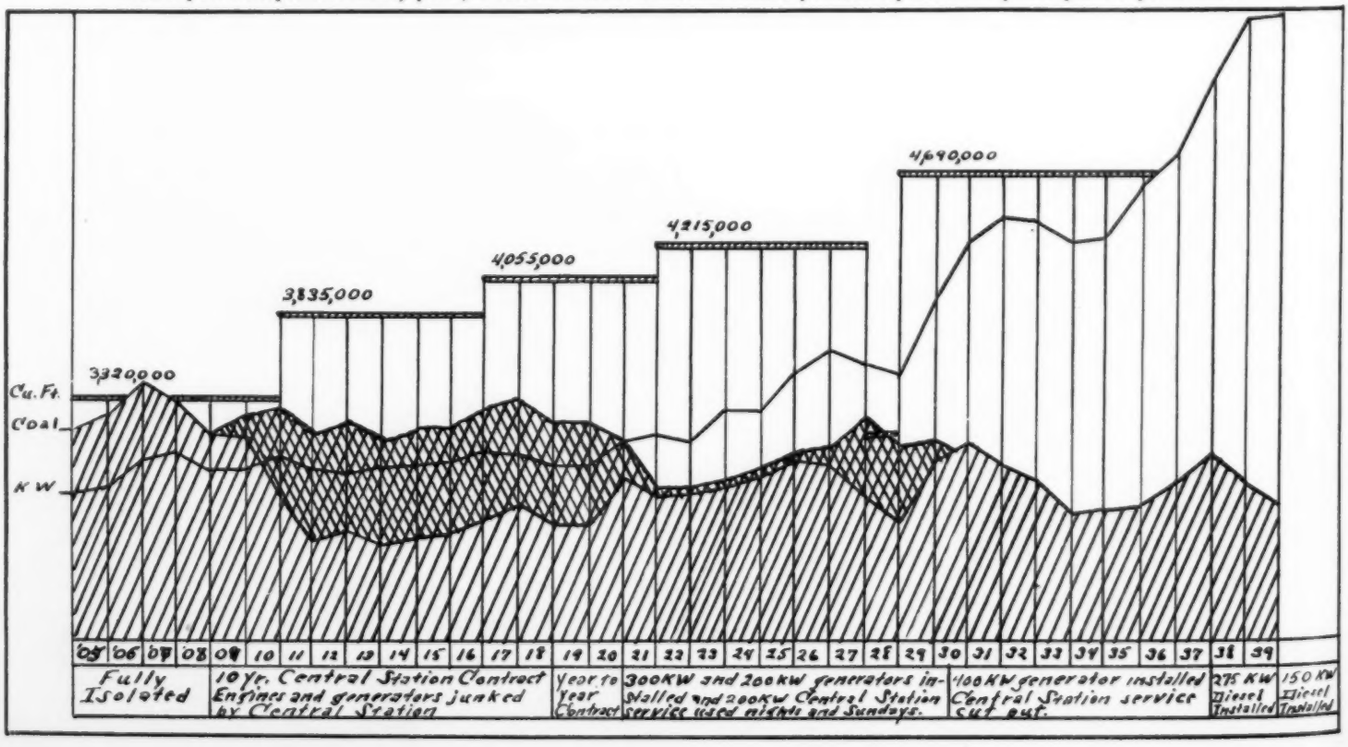
3. There is no occasion to worry about noise or vibration from the Diesel engines if they are properly muffled and isolated from the building foundation.

4. The same type of mechanically-minded labor which is used to care for boilers, radiators, elevators, and other equipment in the average building can be trained quite easily to handle the Diesel equipment.

The chart shown below covers a period of thirty-five years and shows the pounds of coal used, the kilowatts generated and purchased, and the cubic contents heated and lighted. From 1908 to 1930 current was purchased from the public utility company. For comparative purposes, this money spent for current was changed to equivalent pounds of coal as is shown on the chart above the coal line which represents what might be called a power plant expense line.

As operators of a steam electric plant are not responsible for the price of coal, they are concerned only with fuel consumption per kw. In 1904, the plant used 19.4 lbs. of coal per kwh. At present the plant is producing hot water, high pressure steam used in two laboratories and for cooking purposes, as well as electrical energy on a fuel basis of 3 lbs. per kwh.

Thirty-five year chart showing growth of heating load (top bars), coal purchased, and kilowatt output. The heavily shaded portion represents money paid for current and the combined shaded portions represent the power plant expense line.



Exterior of the La Junta, Colorado, Light and Power Plant.

LA JUNTA, COLORADO

By R. R. SCHOOLEY*

THE citizens of La Junta, Colorado, led by their forceful young Mayor, Councilmen, and the Municipal League, recently celebrated the successful culmination of a long campaign for municipal ownership of electric light and power facilities in the formal dedication of a new half million dollar Municipal Light & Power Plant.

Accompanying photographs picture the physical details of the plant and equipment as furnished and constructed by Fairbanks, Morse & Co., under the design and supervision of E. T. Archer & Company, Kansas City, Missouri. Financing by revenue bonds was handled by Brown, Schlessman, Owen & Company, Investment Bankers of Denver; legal phases and court procedure were ably carried out by the law firm of Pershing, Nye, Bosworth & Dick also of Denver.

But, while the pictures show the tangible evidence of another city's successful quest for lower light rates, better street lighting, and annual profits for the benefit of the city, the real story, as is often the case, is behind the picture. La Junta's plant did not "just happen." It was not built in weeks or months, although the actual construction period covered but a few months.

A detailed history of the many problems encountered and their solution, in the long drawn out struggle for municipal ownership in La Junta, would provide a rather complete textbook on this subject. Only a brief outline can be set forth here. Five years ago the first definite step was taken by organization of the Municipal League, largely consisting of Santa Fe Railroad men.

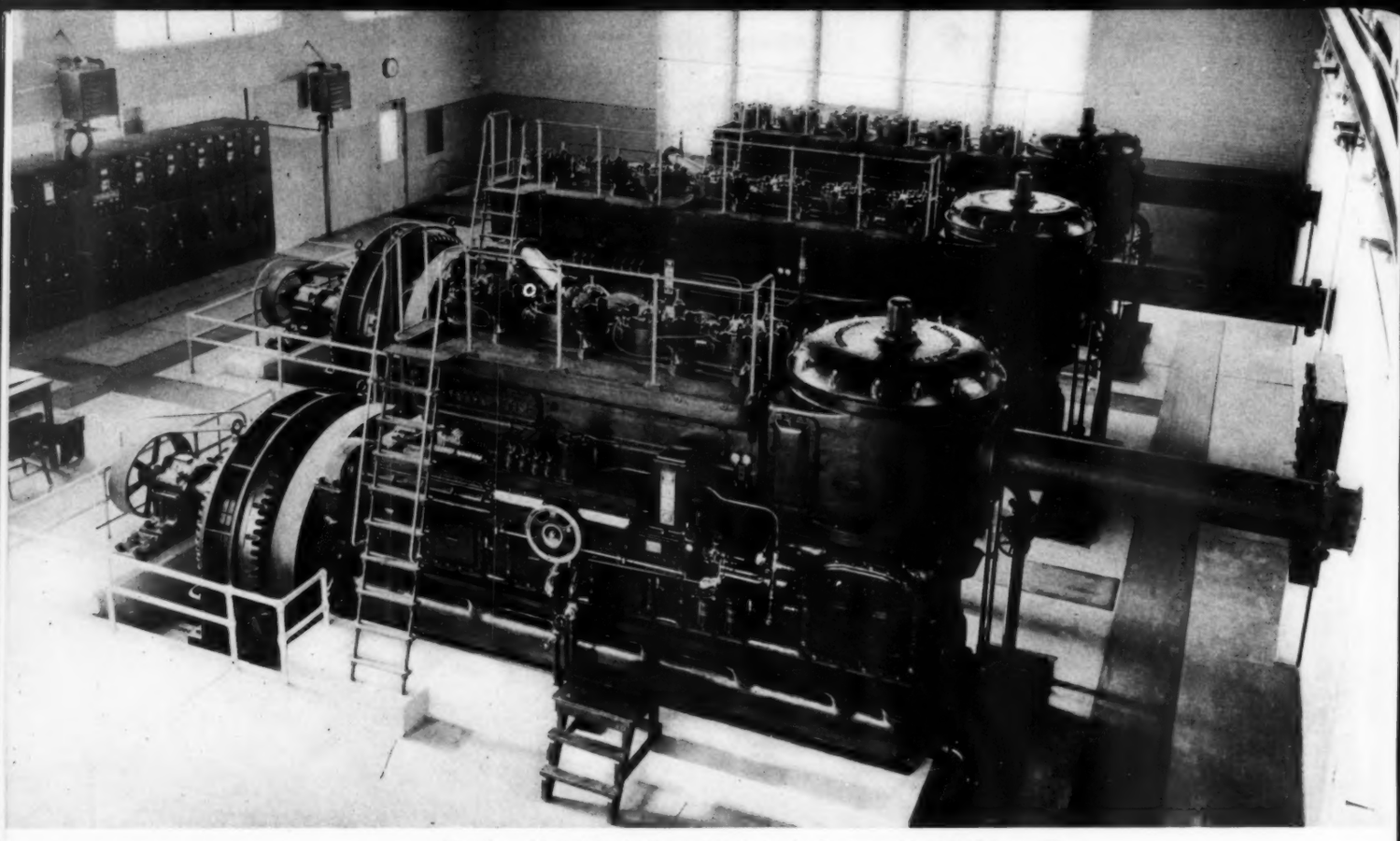
La Junta's history extends back to the early Spanish settlement days, as is indicated by its name, and that of Otero County, of which it is county seat. Transportation, east and west, always has been its chief reason for being; first developed the Santa Fe Trail, followed by the railroad of the same name which, together with farming in the irrigated valley and ranching, are the principal means of livelihood.

The Municipal League was formed somewhat before expiration of the existing franchise of the power company supplying electricity by transmission line from Canon City 110 miles away. The League felt that a city of 8000 was entitled to its own generating plant and launched an active campaign against franchise renewal and for city ownership. The city council, however, called an election for a new franchise over their protest and the battle was on in earnest.

The League solicited cash subscriptions and memberships, spent the money for handbills and advertising, and its members worked day and night expounding the benefits of Municipal Ownership from door to door. It was, to state it mildly, a spirited battle on both sides. At that time, probably, the major part of the more financially influential element of the city was against city ownership, but the franchise election was defeated by a small majority through the vigor and careful organization of the League campaign.

That was the beginning. The next step was the election of a Mayor and Council pledged to Municipal Ownership and supported staunchly by the League throughout the long

*E. T. Archer & Company, Consulting Engineers, Kansas City, Mo.



The three big Fairbanks-Morse Diesels in the La Junta Municipal Power Plant.

battle. The election was a repetition of the franchise election both in activity and closeness of the result.

The Mayor and Council, after thorough investigation employed the engineers, attorneys and bankers previously mentioned to work with the Council and League in their various capacities, to bring before the voters complete and unbiased information. Their efforts were delayed by court actions brought by opponents of City ownership, but finally an election was called for May 10, 1938 to vote $497,000.00 revenue in bonds. Proponents of both sides of the issue intensified their activities and all the stratagems of modern political campaign were used. When the votes were counted the bonds had carried by approximately 12%.

Notwithstanding this result, court actions were again instituted by the Power Company and while the Mayor and Council proceeded to advertise for construction bids and awarded a complete contract to Fairbanks, Morse & Company, actual starting of construction was delayed for more than a year until the Supreme Court had ruled in favor of the City.

While court actions were pending, the term of the Mayor and Council expired and a vigorous attempt was made to defeat them for re-election. The campaign was fully as active and vigorous as those preceding, but the result was different. Fallacies of most of the arguments against City ownership were now more clearly understood and the Mayor and Council were reelected by a two to one majority.

Shortly thereafter the Supreme Court's favorable ruling was made. The City was successful in buying the existing distribution system at a price sufficiently below the cost of an entirely new system to allow of its rehabilitation within the bond funds which was carried on during construction of the generating plant.

And that's the story behind the story told by the accompanying photographs: the tale of concrete accomplishment brought about by the intelligent and aggressive leadership of the Citizens of La Junta by their Mayor and Council and Municipal League, with the active cooperation of reliable and experienced attorneys, engineers, financiers, and Diesel engine builders.

The La Junta power plant building is modern in design, of pressed brick and steel construction, measuring 79 ft. by 85 ft., with a full concrete basement. The generating machinery consists of three Fairbanks-Morse, Model 33, 16" x 20", Diesel engines and F-M generators: one 700 hp., one 1050 hp. and one 1225 hp. Principal engine accessories are Nugent fuel oil filters, Maxim exhaust silencers, Coppus intake air filters, a Marley induced draft cooling tower, a Hilco lube oil reclaimer, and Alnor Pyrometers. Complete systems of alarms and electrical controls are installed for protection of the Diesels. All auxiliary pumps are installed in duplicate. The switchboard is a ten-panel cubicle type of Westinghouse manufacture.

Three years ago the engineers prepared a comprehensive preliminary report which included detailed estimated costs of operation, maintenance, depreciation, debt service, tax payments in lieu of private utility taxes, and anticipated gross incomes and net profits. The first thirty days' operation is just now completed and it is interesting to compare the results obtained with the estimates as prepared by the engineers three years ago. This comparison is as follows:

GROSS REVENUES

Actual received first month	$11,352.52
Estimated per month	11,283.13
Estimate safe by	69.39

OPERATION AND MAINTENANCE COST

Estimated per month	$ 4,364.94
Actual cost first month	4,274.60
Estimate safe by	90.34

GROSS PROFIT PER MONTH

Actual first month's operation	$ 7,077.92
Estimated in Engineer's report	6,918.19
Estimate safe by	159.73

DEBT SERVICE PER MONTH

Estimated ($497,000 10 yr. 4% bonds)	$ 5,052.83
Actual ($475,000 10 yr. 4% bonds)	4,829.17
Estimate safe by	223.66

NET PROFIT PER MONTH

Actual first month of operation	$ 2,248.75
Estimated in Engineer's report	1,865.36
Estimate safe by	383.39

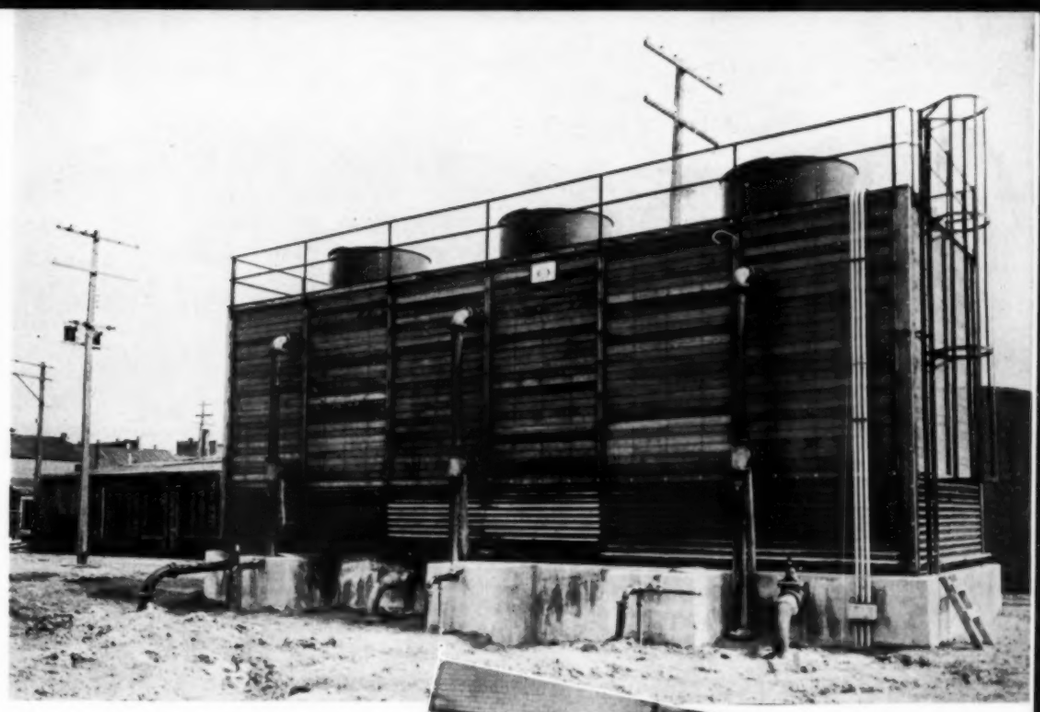
Actual yearly net profits to the City based on the first month's operation over and above all operation and maintenance, debt service, previous tax received from the Company and a 10% rate reduction will amount to $26,985.00 per year with every indication that this profit will increase rapidly under lower rates and municipal ownership.

The estimated cost of the plant and distribution system was $497,000.00—the actual cost, including all miscellaneous expenses, was $475.000.00.

The estimated time required to retire the bonded debt was ten years. On the basis of the first month's operation it appears possible to retire the amount within seven years.

The electric rates under municipal operation were established at approximately 10% less than those in effect under the private utility. The operation and maintenance costs listed above include $781.56 per month as an equivalent to the utility company's Franchise Tax and Property Tax payments.

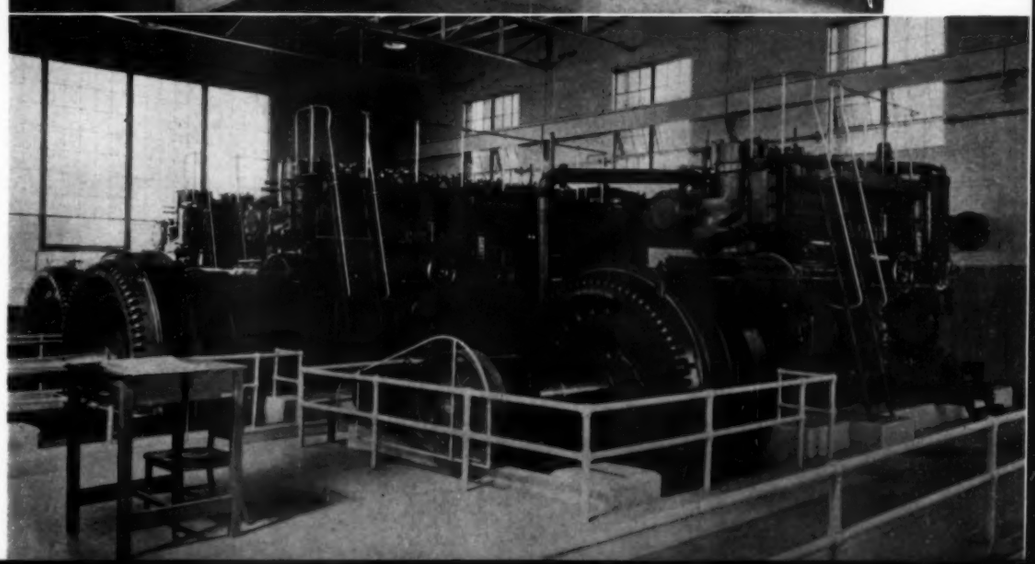
The figures as given above show the immediate advantages of municipal operation of electric utilities.



The Marley induced draft cooling tower.

The Westinghouse ten-panel cubicle type switchboard.

The duplex Hilco Oil Reclaimer.



Another general view of the interior of the La Junta, Colorado, Municipal Power Plant, showing 2,975 hp. of Fairbanks-Morse Diesels.

The "Oswell Foss," a sturdy Diesel tug, is the latest addition to the famous Foss fleet.

TUGBOAT ANNIE HAS A CHILD

By CHAS. F. A. MANN

MADE famous by the "Tugboat Annie" stories and the movie, the great Foss fleet of towboats and barges continues to expand and reach new horizons with its limitless variety of towboat "choring" on Puget Sound, in Alaska, California, and far out into the Pacific.

Growing up with Pacific Northwest industry, the Foss organization is a unique by-product of the vast logging and lumbering operations of the Northwest coast. Based on low-cost water transportation and the fact that no known method of hauling tonnage has ever been devised other than huge rafts of logs up to a couple of million feet, the Northwest industry gave rise to the transporting of fuel oil, hogged fuel, sulphur, lime-rock, fabricated steel, sand and gravel, and the good old business of pushing liners into their piers. With the pioneer job of towing logs rose the present industrial machinery of the whole Northwest.

And with this rise, the ideas of Scandinavian thrift and industry, as applied to the tugboat business by Mother and Father Ross, gave rise to one of America's most interesting, well-managed and efficiently operated tugboat companies in this line of activity.

The Foss organization began with gas launches and rowboats; then tall-stacked steam tugs and, finally, about ten years ago, it emerged as the owner of America's first 100% Diesel-powered fleet of tugboats.

Annually, at the Foss Shipyard in Tacoma, a regular program of overhaul, maintenance, and rebuilding of tugs and scows takes place. And certain years bring out one or two new tugs to

join their numbered and named fleet of sister ships. Now, in 1940, the tugboat "Blessed Event" at the Foss yard is the pride and joy of the fleet, the highest powered of the medium-sized tugs yet put out by Foss. It is named the *Oswell Foss,* after the Foss clansman who died during the World War.

The *Oswell Foss* is a compact, heavily built wooden tugboat, 69.9 ft. x 19.3 ft. x 9.25 ft. overall. Heavy rotproofed Douglas Fir framing and Yellow Cedar planking, welded together with the usual huge bolts and spikes by the skilled Scandanavian boatbuilders, gives her a typical Foss hull in strength, lines and external appearance.

Below the forepeak is a 6 hp. General Electric motor to drive the anchor winch, followed by large lockers, lavatory space and roomy quarters for a crew of four. The roomy galley, extending full width of the hull, follows next aft, with Stewart Warner refrigerator, an Ingle oil fired range and even a portable radio. The lighting arrangement in the two forward spaces is interesting. The pilot house is raised about 2½ feet above the main deck level. Immediately below the floor level of the pilot house is a row of 8 large brass-framed pothole lights, admitting daylight on three sides to the hollow space under the pilot house. This space forms an extra ceiling above the level of the crew's quarters and galley, which are divided by a bulkhead with suitable door between. Thus, deep in the forward part of a low-slung tug, the crew has plenty of daylight, adequate for reading even in a gloomy Puget Sound winter day. This is a Foss design innovation used on many of their ships.

Immediately aft of the galley is a bulkhead extending to the main deck level, followed by the compact engine room. Transversely across the forward engine room bulkhead is the Diesel-powered auxiliary set. This consists of a 4 cylinder 44 hp. Caterpillar Diesel, driving through shaft extension and V Belt drives, first a Worthington Air Compressor, then a 30 kw. Westinghouse 110 volt D.C. generator, and a 6 inch De Laval fire pump, for fire fighting and scow cleaning. A 56 Cell 240 Ampere hour 110 volt Willard Battery set is "draped" neatly on the forward Portside of the engine room.

The main propulsion consists of an eight cylinder, 12 inch x 15 inch 350 rpm. Enterprise four cycle Diesel, driving a 3 Bladed Doran Bronze propeller having a 68 inch diameter, and through a Kingsbury thrust bearing. The Enterprise Diesel develops 450 hp. at 350 rpm. Full pilot house controls are fitted, including a duplicate instrument panel and a Weston tachometer. A third control position is mounted atop the pilot house, which included the pneumatic rudder control stand, operating much like the old-time streetcar air brake lever system. A special streamlined steel rudder is employed. The Enterprise engine is equipped with an Alnor pyrometer, Purolator oil filters on the fuel line, and Nugent filter on the lube line, and a small Quincy compressor with a 3½ kw. Imperial belt driven generator. Under normal operation the auxiliary Diesel is used only for pumping work or fire fighting. A Maxim spark arrester also is fitted. Above the engine room level is the enclosed 25 hp. Westinghouse geared motor for operating the towing winch. It is this large motor that requires the large storage battery installation.

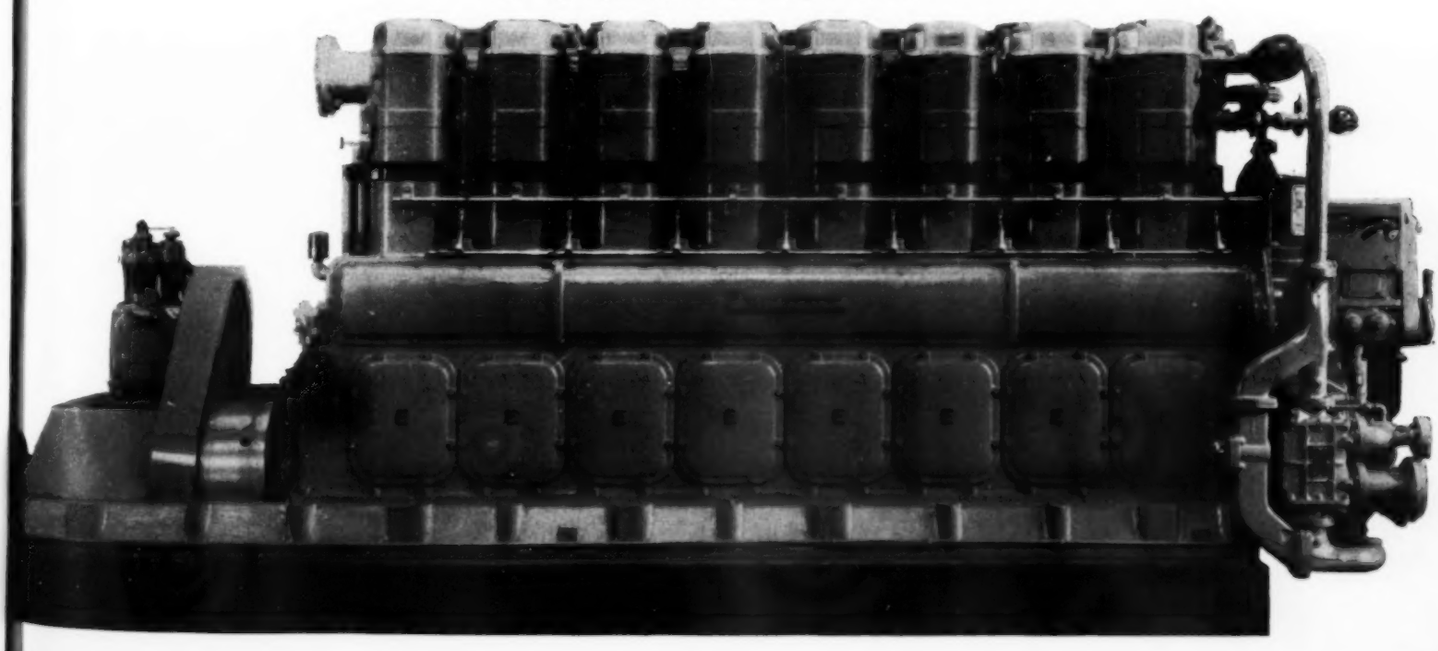
Also piled neatly into the engine room are the long fuel tanks, against the sides of the after end next to the shaft alley. A fuel bunker for 7,500 gallons is carried, in addition to sixteen barrels of lube oil. A Harrison heat exchanger is fitted on the Starboard side of the Enterprise Diesel, for fresh water cooling.

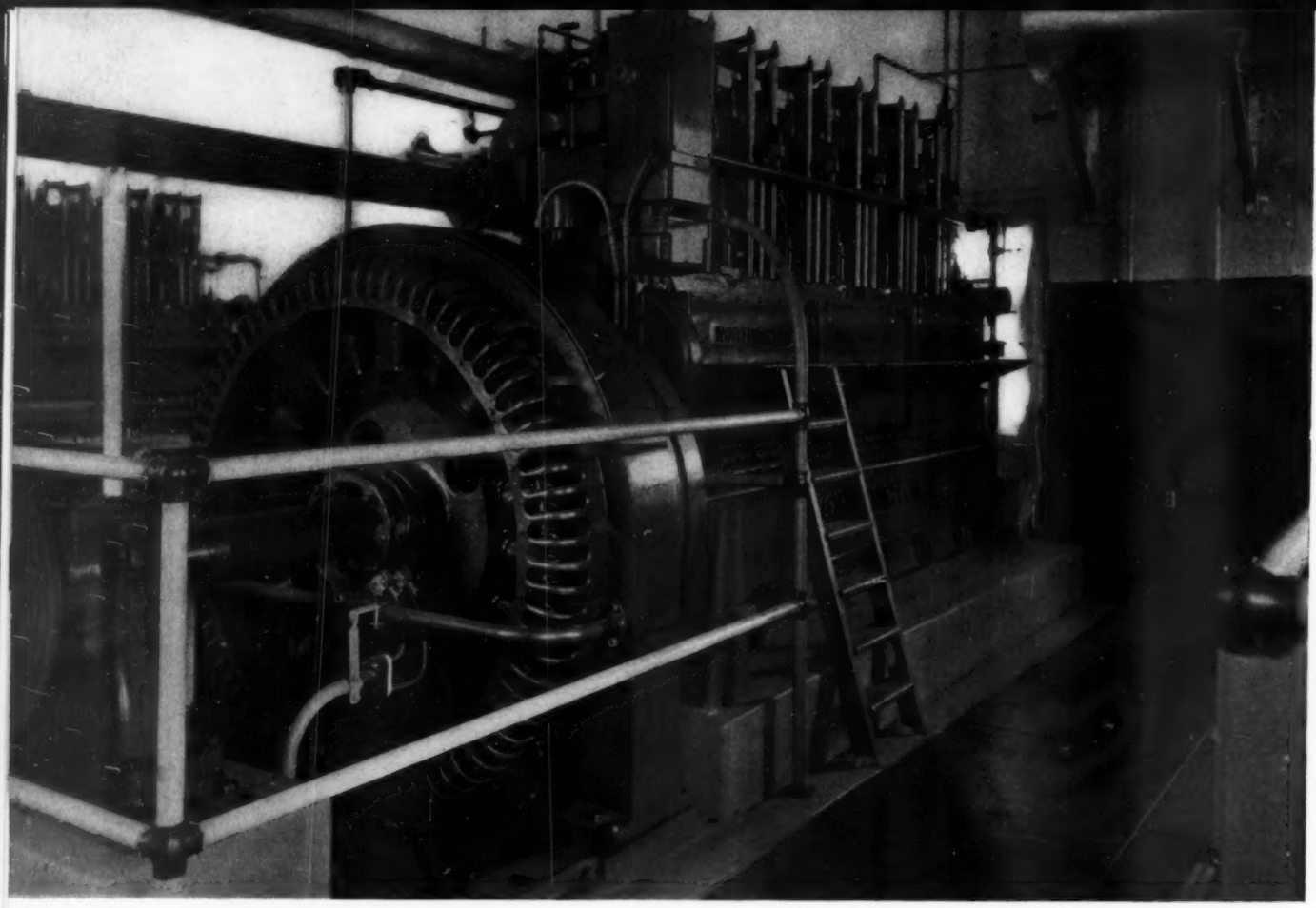
An interesting feature of the interior is the light finished natural woodwork, easily cleaned and adding to the light, airy effect. The deck machinery was built by the Dravis Machine Co. of Tacoma, after Foss specifications, which included the customary large towing winch. A 10 inch searchlight is controlled from both upper and lower piloting positions. A large food locker and a large paint-oil locker, waterproof and ventilated, is fitted atop the deckhouse, and a Cunningham air whistle is carried. A Delco fresh water system for hot and cold domestic water supply is carried, while a dinghy and a workboat are carried on the after deckhouse roof, over the engine room-captains spaces.

The new ship is a model of practical, husky design, having been designed and built by the Marine Superintendent, Orville Sund, and the Shipyard Foreman, Thor Simonsen. This will be the fifth Enterprise installation in the Foss fleet, the "Anna Foss" having a 300 hp. Enterprise; the Foss No. 16 a 200 hp., the Foss No. 19 a 200 hp. and the Thea Foss a 120 hp. Enterprise Diesel.

The *Oswell Foss* will be skippered by Capt. Oscar Rolstad and Engineered by Niels Olson, two Foss veterans who know how to make a towboat operate efficiently.

The eight cylinder, 450 hp. Enterprise Diesel.





Close-up view of one of the three Worthington Diesels and General Electric generators.

FLOYDADA, TEXAS

By ORVILLE ADAMS

FLOYDADA is a progressive community of 3,000 people surrounded by a prosperous farming and cattle country. Just an hour's drive from Lubbock, and hard by Crosbyton, where other municipal Diesel plants are located, Floydada, in common with many other West Texas towns, had every reason for building its own plant. Starting its operation in January, 1940, the municipal plant now serves more than 70 per cent of the local connections, with more customers coming over to the city plant each month. At the present time, 550 customers require about 3,000 kw. hours every day. The peak demand increases rapidly with the onset of summer weather, air conditioning, refrigeration, and pumping for yard irrigation. The summer peaks for towns in this region are always far above any winter peak for these reasons, particularly if the people enjoy reasonable rates for water and lights and know that the profits on the operation are returned to the city funds for many needed improvement. The great plains is a semi-arid region with practically no rainfall between early spring and late fall, and too often not much in the winter, with the result that the communities and towns on the plains require large amounts of current and water per capita for comfortable living under modern conditions.

The new power plant comprises three Worthington, four cycle, six cylinder, 11" x 14½" solid injection Diesel engines rated 300 hp. each at 400 rpm., and direct connected to 200 kw. General Electric alternators with V-belt driven exciters. The engines are the latest Type C Worthington design, operating on a compression ratio of 14.3 to 1, or a compression pressure of about 480 lbs. at sea level. The current is generated and distributed at 2,300 volts to the main transmission system, and the street lighting system. Ample space for the engines and generators is provided by an adequately lighted and ventilated power house building of brick construction.

Partially financed by a Federal grant, the plant was engineered by the PWA specifications and comprises essential features which are required for such regulations. Each engine is equipped with the necessary accessories, comprising fuel and lube oil filters, a closed cooling system, air filters, silencers, pyrometers and hydraulic governors of the isochronous type.

The fuel and lubricating oil is passed through

Cuno edge type filters. The lubricating oil is purified by means of a De Laval centrifuge equipped with an electric heating coil. A Worthington transfer pump conveys fuel from the 15,000 gallon underground tank to the day tanks on the engine room wall, from which the fuel is fed by gravity to the fuel injection pump reservoirs. The circulating lubricating oil is cooled by means of a Ross Heater lube oil shell and tube cooler bracketed to the end of the engine. An automatic switch cuts off the fuel oil in case of failure of the lubricating oil pressure.

The air intake and exhaust system is simple and efficient, and comprise straight horizontal headers extending from the engines without bends or elbows straight through the engine room walls to air filters and silencers just on the outside of the building. The exhaust connects directly to Maxim silencers mounted on steel frame supports, and the air intake header connects to American Cycoil air filters likewise located adjacent to the silencer stands, as shown in the photograph of the building exterior. The size and length of pipe is such as to give the most efficient air intake and discharge of the exhaust gases.

The water cooling system is designed as a closed cooling system with a battery of Binks coils in the cooling tower, cooled by means of Binks raw water sprays. The entire cooling system is a Binks design, with General Electric motors and Worthington centrifugal pumps for circulating both the raw water and the soft water. An Elgin water softener provides a reliable source of soft water for make up, and is operated periodically, being a zeolite system long used for this purpose. An Automatic Switch Company control valve is a part of the water safety system. The entire cooling system has been carefully engineered to insure maximum safety and freedom from scale in the jackets.

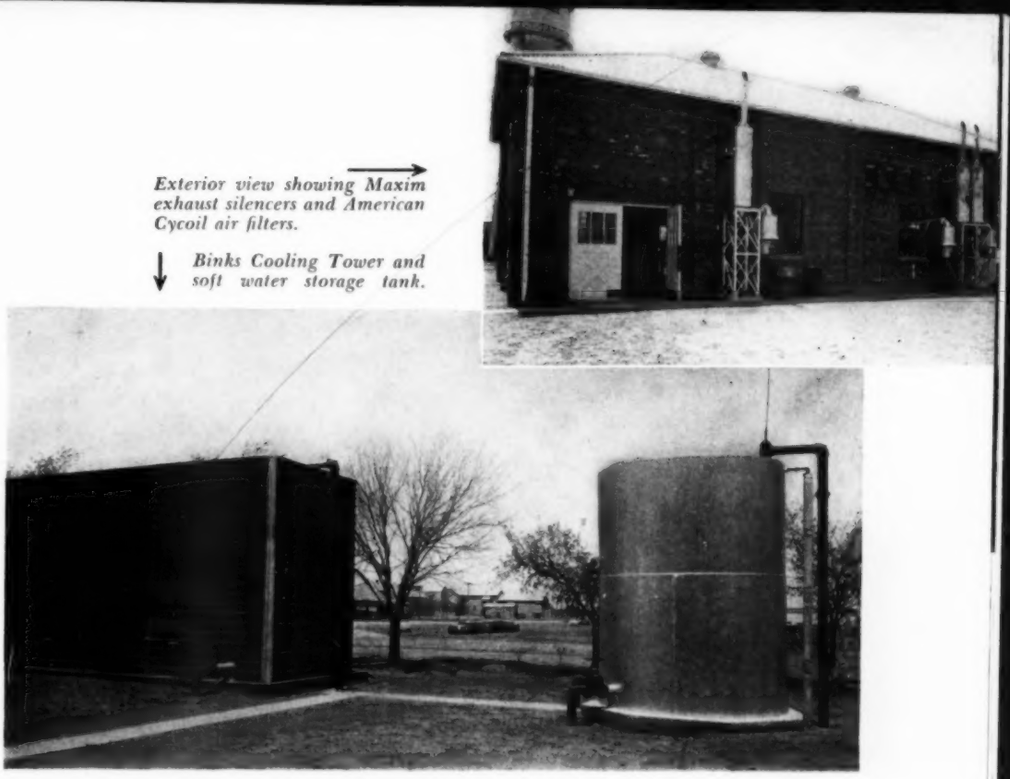
The switchboard and switchgear is the standard General Electric type, fully equipped with regulators and necessary instruments, meters and the like, and is of the modern dead front type.

The annual output of the plant is expected to exceed a million kwh. the first year, to be delivered at the switchboard at a fuel cost not exceeding 1/3 cents per kwh. The fuel oil is supplied by the Post Refining Company, and is a 33 Be. gas oil having a heating value of 19,250 b.t.u. per lb. and weighing 7.2 lbs. per gallon. A 12 kw. heating coil is provided for the fuel oil which is delivered at the engine at the proper temperature for the most efficient injection and combustion. An average fuel economy of 12 kw. hrs. per gallon is being realized at a cost of 4 cents per gallon delivered, or approximately 1/3 cents per kwh. The lubricating oil consumption is about 5,000 horsepower hours per gallon, DTE medium lubricating oil being used for the power cylinders. The crankcase oil is regularly centrifuged, and provision for an oil reclaimer is being planned at this writing to further increase the lubricating economy of this plant.

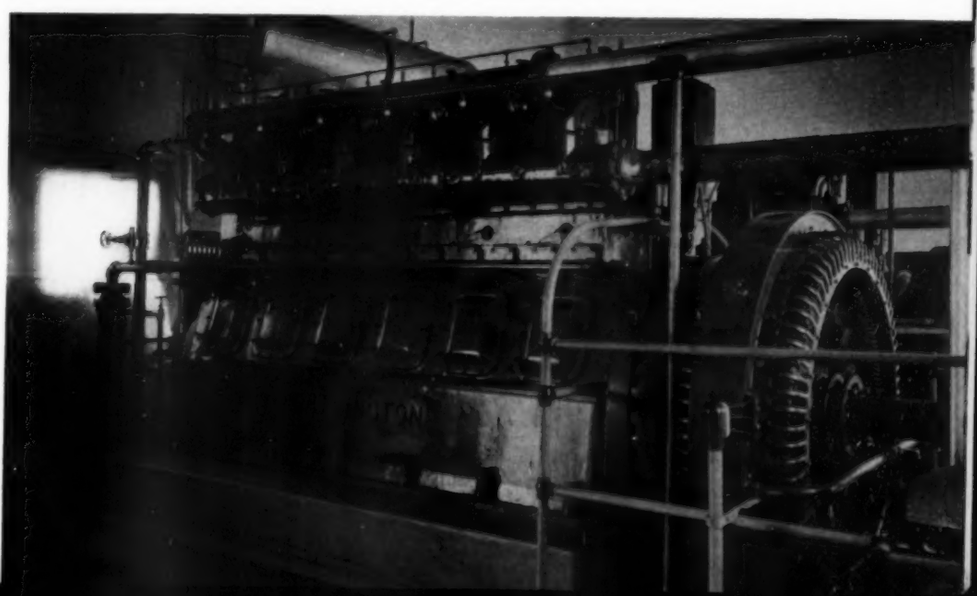
According to Mr. J. L. Puckett, Chief Engineer, and his staff of operators, the operation of these engines has been very satisfactory and efficient. From Mr. Puckett's log sheet, it was determined that the load varied from about 65 kw. in the early hours of the morning to as high as 200 kw. at the evening peaks. An average day is from 2,700 to 3,000 kw. total, or an average of around 125 kw. per hour, varying from 115 to 130, depending upon the temperature and weather conditions which affect the consumption of current. Consumer rates for residence lighting indicate the possibility for increasing use of electricity for general uses to about double the normal consumption per meter in the average town. The rates charged for residence lighting are as follows: first 20 kwh. at 9c; next 100 kwh. at 3c; excess at 1.8c. The minimum bill is $1.50 with the usual discount for prompt payment. The average bill of $4.80 yields therefore a kwh. cost of between 4 and 5 cents, a net cost with which the people are well pleased, since they know that the profits go into the city to save them taxes and to make improvements.

Exterior view showing Maxim exhaust silencers and American Cycoil air filters.

Binks Cooling Tower and soft water storage tank.



View of the exhaust side of the Worthington Diesel; the lube oil cooler is seen extreme left.



NEW DIESEL TUG "SENECA"

for Jas. McWilliams Blue Line

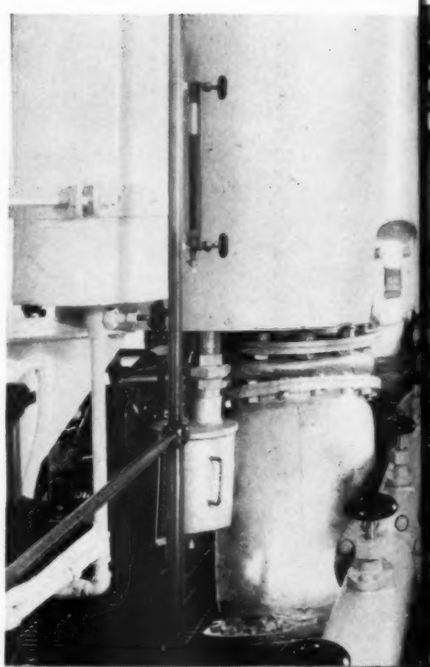
By WILBUR W. YOUNG

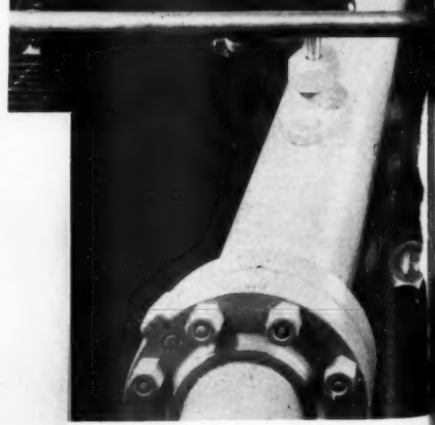
LATE Sunday afternoon, June 16th, the new Diesel tug "Seneca" tied up at Perth Amboy Drydock, Perth Amboy, N. J., after battling her way from Port Arthur, Texas, through the Gulf, around the Florida Keys and up the Coast for 2030 sea miles in the teeth of pounding seas whipped up by a northeaster. She was 8 days, 22 hours, and 30 minutes en route, which includes a couple of layovers to allow the crew to catch its breath. Salty from stem to stern outside, the "Seneca" took her continuous beating without shipping a drop. In the words of her master, "She could take it but her crew couldn't." All hands reported that her Alco-Sulzer Diesel propulsion engine performed beautifuiiy on this strenuous trip.

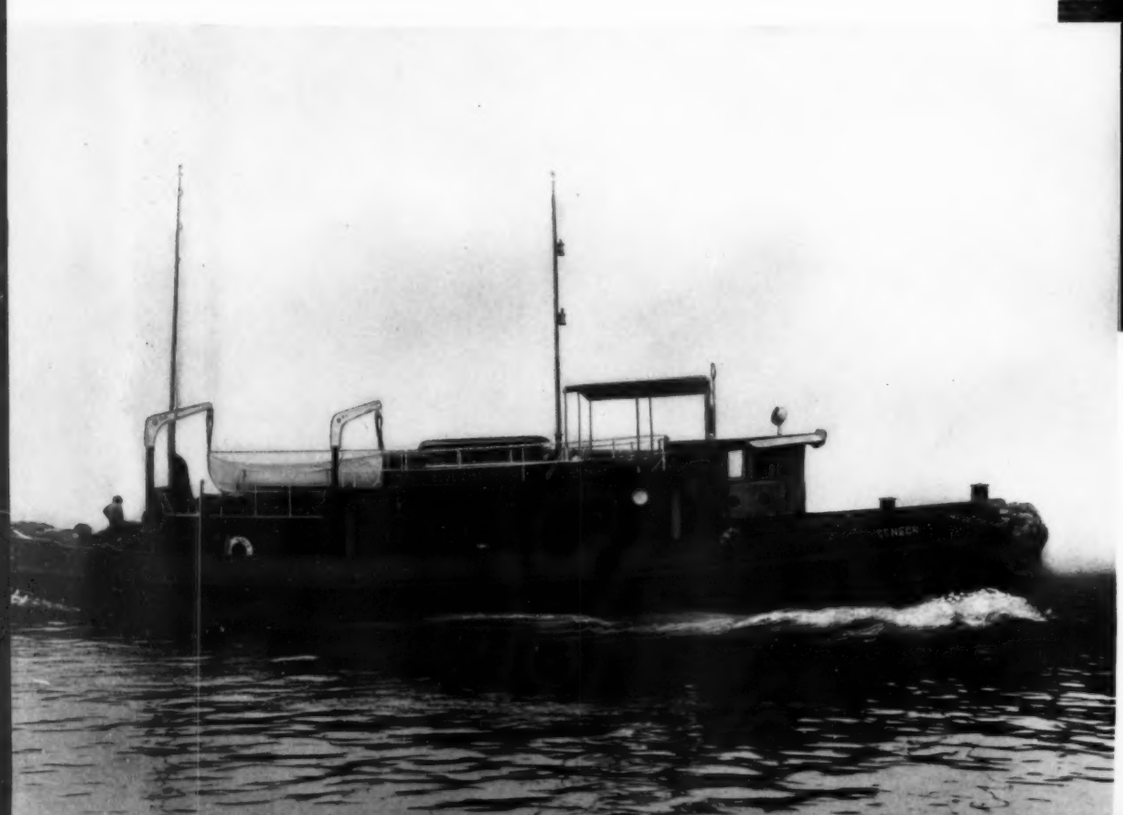
The "Seneca" was built at Pennsylvania Shipyard, Beaumont, Texas, for the Jas. McWilliams Blue Line. She immediately joined a fleet of five Diesel tugs, two owned and three chartered by the Blue Line. Within thirty-six hours of her arrival, just long enough for hanging fenders, checking up and finishing touches, she took on her first assignment, a tow to Detroit. No time was given to the fanfare of which the "Seneca" is fully worthy.

More powerful than the average tug, her main engine is an Alco-Sulzer, six cylinders, 14" bore, 23½" stroke, two cycle, direct reversible Diesel rated 1080 hp. at 277 rpm. Fresh water, salt water, lubricating oil and fuel oil pumps are built-in, as are the starting air compressor and the Kingsbury thrust bearing. The engine is fitted with two Model 94D Manzel force feed lubricators having a total of twenty-nine feeds. The exhaust silencer is a Maxim, Spark arrester type, mounted between the engine and the stack. The unusually low stack precluded mounting the exhaust silencer within the stack as is common in most tugs. The engine tachometer is a Weston marine magneto with an indicator on the gauge board in the upper engine room.

Sentinal filters are fitted to the fuel and lube oil lines. Lube oil reclamation equipment is a





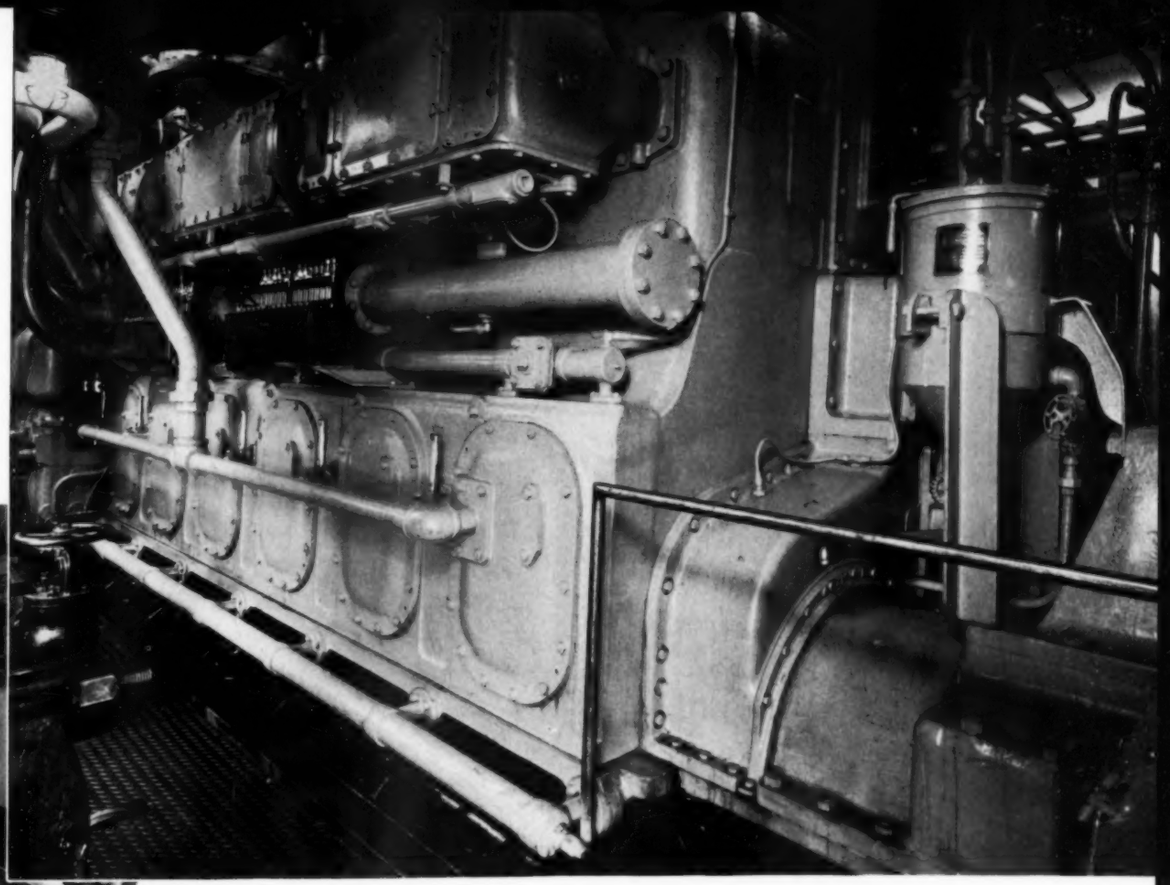


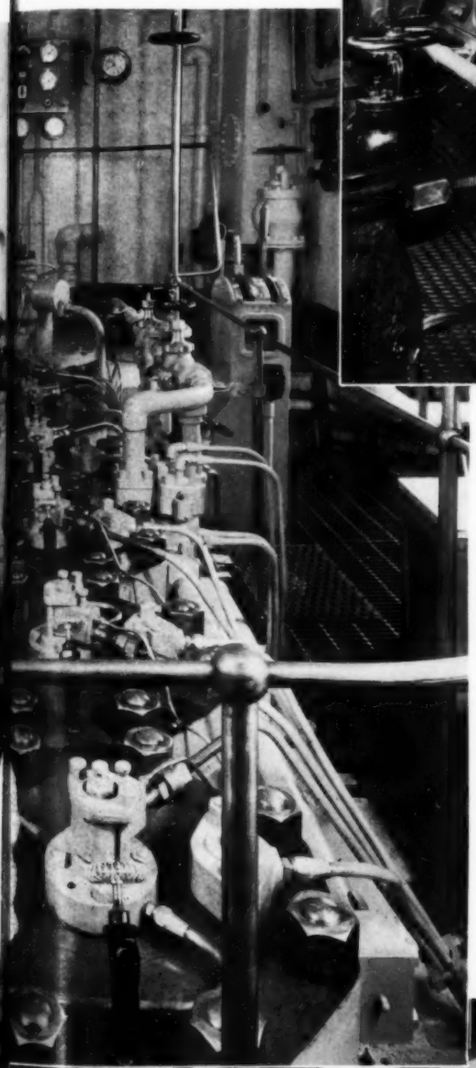
The long, low lines of the "Seneca" are functional as well as trim. She was designed for both sea and canal duty.

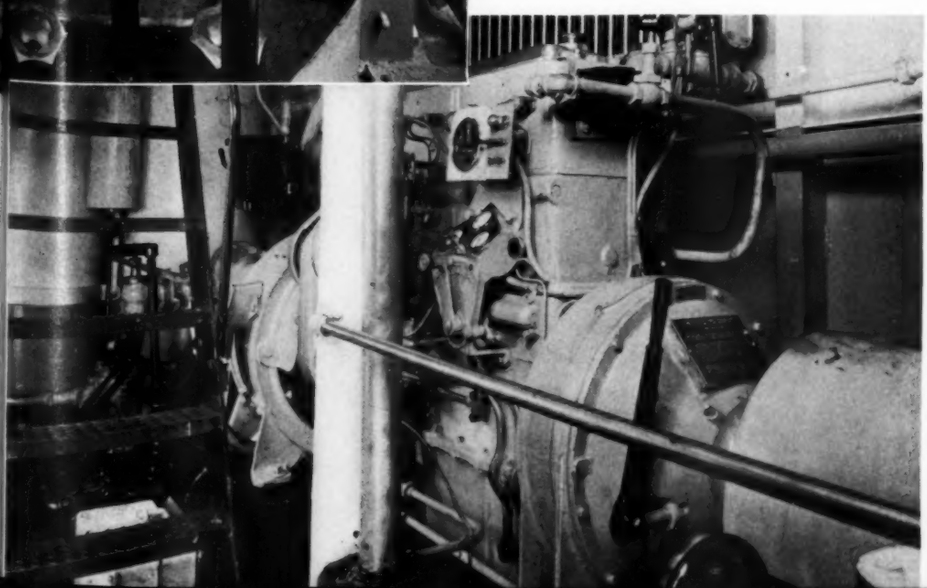
The Cummins 4 cylinder auxiliary Diesel with Twin Disc clutch and Westinghouse generator.

View looking forward along exhaust side of the Alco-Sulzer 1080 hp. main Diesel. Note Manzel lubricators left center.

Top view of the main Diesel showing Maxim spark arrester exhaust silencer upper left and Weston tachometer indicator on forward bulkhead.







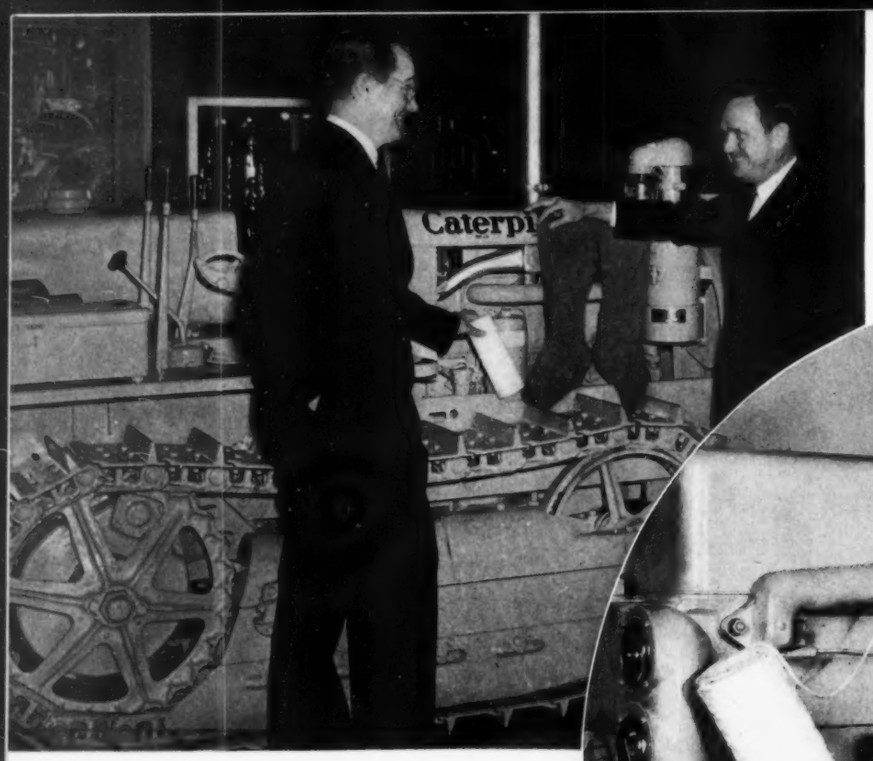
Milwaukee Refiner. The auxiliary fuel transfer system is fitted with Elliott twin strainers as are the bilge pump line and both sea and fresh water lines.

A Cummins four cylinder Diesel supplies auxiliary power. This engine is fitted with Leece-Neville electric starting motor and generator and Donaldson intake air filter. The service pump aft is driven by this engine through a Twin Disc clutch and Falk reduction gear. Direct connected, forward, is the Westinghouse 20 kw. auxiliary generator. The main engine shaft generator is an Electro-Dynamic 20/25 kw. reversible shaft generator driven through Dayton Rubber multiple V belts. A 56 cell, 110 volt Exide Ironclad battery floats on the line. The Gardner-Denver auxiliary air compressor mounted in the extreme after part of the engine room is V belted to a Westinghouse motor. The Smith-Meeker switchboard is fitted with Weston meters and Westinghouse rheostats.

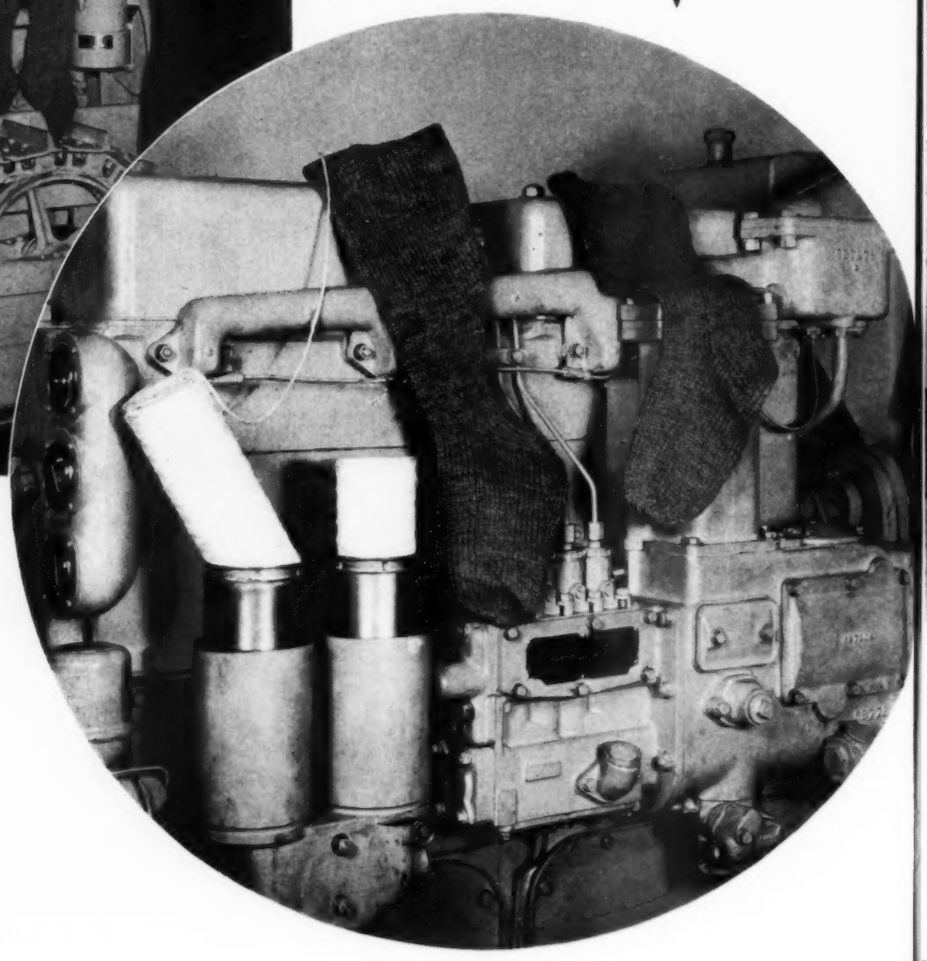
The main engine is set low, on a solid bed and presents a trim, compact appearance. A one-half ton Reading chain hoist serves the main engine. General arrangement of the machinery leaves ample working room within over all hull dimensions which are somewhat less than ordinary for a tug of the power of the "Seneca". Her LOA is 94′, beam 23.09′ and depth 11′. She has an all welded steel hull with long sweeping lines.

Quarters, consisting of a wheelhouse room, two wing rooms and forecastle sleep a total of thirteen. A duplicate of the wheelhouse control station is provided on the top deck for close maneuvering and bad weather going. The "Seneca" represents the best in modern tugboat design and construction down to the 25 watt Jefferson-Travis radio telephone. This equipment is capable of tuning in on ten channels and will provide complete ship-to-shore communication whether at sea or inland.

The "Seneca" started work, following her maiden voyage from Port Arthur and the subsequent touching up, on June 18, leaving New York, bound for the Great Lakes. The Blue Line is justly proud of her.



Left to right: H. H. Howard, engine sales manager, holding one of the cotton yarn filters used in the Caterpillar D-2 tractor, and Mr. Heacock, Caterpillar's president, displaying the pair of socks of which he is very fond. Closeup of the filter element and socks.



FROM FILTERS TO SOCKS

NOT long ago William Hazlett Upson, creator of "Alexander Botts", sent Caterpillar's President, B. C. Heacock, a pair of cotton socks and while they were neither too shapely nor too clean, it is said that Mr. Heacock holds them in high esteem.

It is not only because Mr. Upson got them originally from Mr. Thomas Lamb, the famous muskrat king of the Pas, Manitoba, but also because these cotton socks were knitted from the entrails of one of Caterpillar's Diesel engines that we present the story of how they came into being for the illumination of our readers.

Caterpillar engineers have developed a filter which has been applied to fuel and lubricating systems on their Diesel engines and tractors. Roughly speaking, this mechanism consists of nothing more nor less than high grade cotton yarn wound around and around a wire screen. The filter elements are so inexpensive that after 1200 hours of service they are simply removed, thrown away, and replaced by new cotton yarn.

But in case you don't know about Mr. Lamb, the muskrat king, perhaps we should tell you that he leases a 10,000 acre island on the delta of the Saskatchewan River, about 75 miles east of The Pas. He owns two Caterpillar Diesel D4 Tractors, which he uses to create and maintain an elaborate system of dams, dikes, etc.

Under the care lavished on them by Mr. Lamb, these little animals last year produced about 16,000 pelts, which were sold at slightly under $1.00 a piece. Besides this industry, their boss catches and sells fish by the ton from his chain of lakes. These enterprises support the district Indian population of several hundred, aside from providing a tidy living for Mr. Lamb, his wife, and nine children.

Mr. Lamb is successful in a large part because he watches all details. As an example, the aforementioned filters sell for $1.15 (Canadian). As it is impossible to reuse the filter, Mr. Lamb turns the used part over to his Indians, and they boil out the oil caught in the yarn, using it for softening moose hide which they make into moccasins. In return for this valuable lubricant, the tribal squaws unwind the yarn, and knit it into socks which they, in turn, give back to Mr. Lamb.

Mr. Lamb doesn't wear the socks; but he does put them in his store, offering them for sale at $1.25 (Canadian) per pair. More often than not, the same socks are sold to the same Indians who knitted them—at a clear profit of 10c a pair for Mr. Lamb.

Exterior view showing intake air stacks, cooling tower and soft water storage tanks.

LUBBOCK, TEXAS

By ORVILLE ADAMS

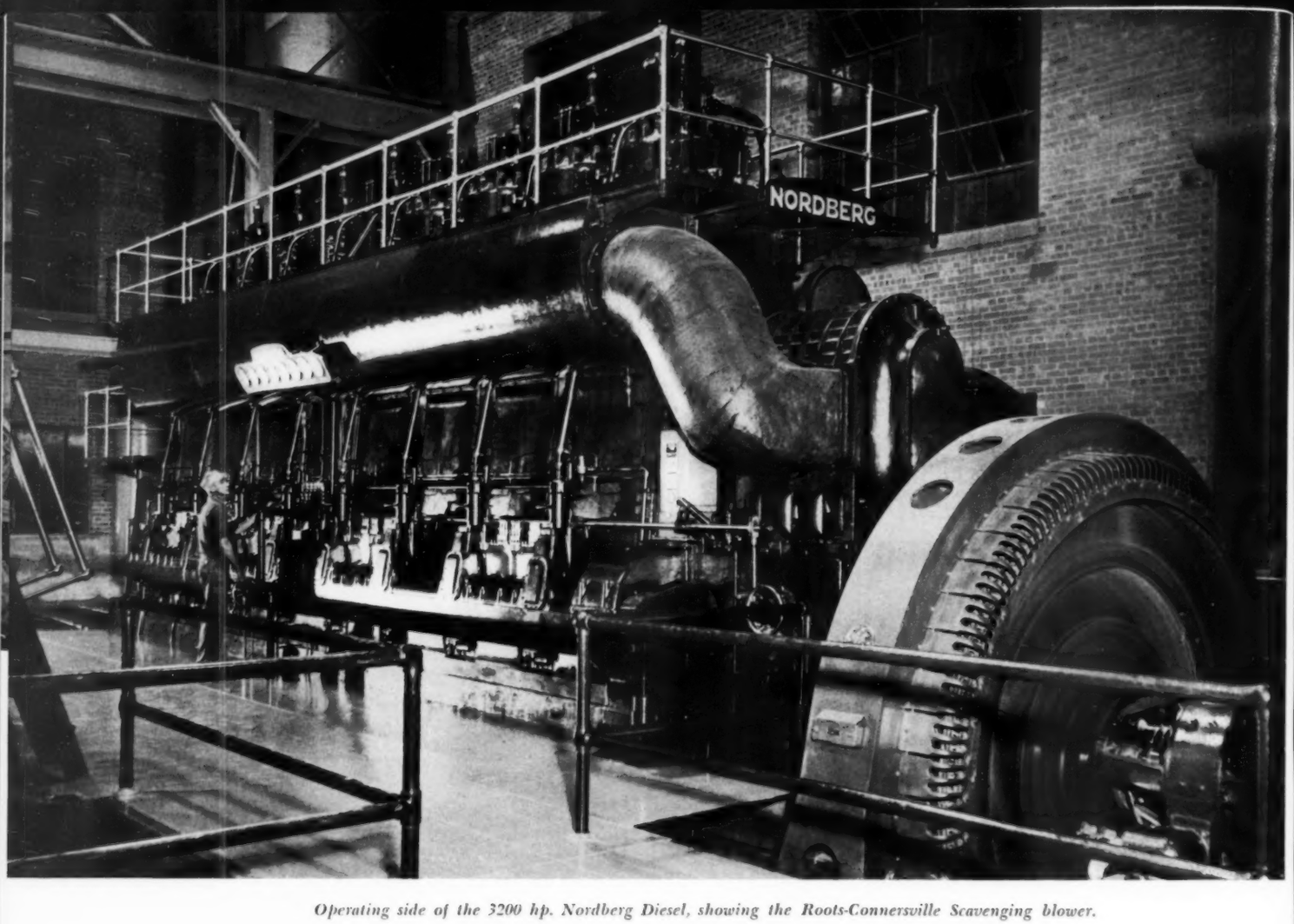
THE city of Lubbock, Texas, the focal point of the Great plains region in West Texas, has maintained a municipal power plant equipped with Diesel engines for many years. The first Diesels were small units installed nearly twenty years ago, but as the city grew and the load increased, larger engines were needed. In 1930, the total installed hp. was approximately 3000 comprising six Fairbanks-Morse engines. Since that time, five large Nordberg Diesels, totalling approximately 10,000 hp., have been added, a new power plant built, and the entire system modernized, four of these with a total capacity of 8,555 hp. Diesel rating are operating on natural gas.

The engines operating on natural gas are one 3200 hp. 8 cylinder, 21″ x 29″, 225 rpm. Nordberg producing a kwh. on 11.3 cu. ft. of gas; one 2250 hp. 6 cylinder Nordberg of the same speed and cylinder size, producing a kwh. on 12.5 cu. ft. of gas; one 8 cylinder, 17″ x 25″ Nordberg rated at 1665 hp. on oil and 1500 hp. on gas producing a kwh. on 11.7 cu. ft. of gas; and one 6 cylinder, 17″ x 24″ Nordberg Diesel rated at 1390 hp. at 257 rpm., producing a kwh. on 13.1 cu. ft. of gas.

The average fuel consumption of these four units, comprising two six cylinder and two 8 cylinder units, was found to be approximately 12.15 cu. ft. per kwh. The gas is metered at 13.6 lbs. absolute which is 8 oz. above atmospheric pressure and the above cu. ft. are referred to 13.1 lbs. absolute and 60° F. saturated.

The heat requirements per kwh., as calculated by Mr. J. J. Graham, Superintendent of the Light and Power plant, and checked against the total fuel requirement and output of these engines over a period of several months, were as follows: High heat supplied by natural gas 10,262 btu.; High heat supplied by the pilot oil 1,180 btu., giving a total high heat units of 11,442 btu. per kwh. These figures are based upon a fuel consumption of 11.3 cu. ft. of natural gas having 917 btu. at this altitude per cu. ft. and the pilot oil weighing 7.2 lbs. per gallon and having a heat content of 19,250 btu. per lb. and costing 3¾ cents per gallon, giving a cost of approximately 27

View of the extensive switchboard.



Operating side of the 3200 hp. Nordberg Diesel, showing the Roots-Connersville Scavenging blower.

cents per million btu. for the oil.

The first Nordberg Air Injection Diesel, a 1250 hp., 20¾" x 28" at 180 rpm. direct connected to a 900 kw. General Electric Generator, was installed about ten years ago and still operates as a Diesel engine on fuel oil.

The second engine, a 1500 hp. Nordberg air injection Diesel installed in 1932, is a 17" x 24", six cylinder engine rated at 1990 on gas at 257 rpm. and changed over to natural gas in 1939 after having operated on fuel oil for seven years. It is direct connected to a General Electric generator rated at 1000 kw. at .8 pf.

The third Gas-Diesel installed in 1936, a Nordberg Air Injection Diesel rated at 1665 hp. on fuel oil and 1500 hp. on gas, is an eight cylinder, 17" x 25" unit operating at 225 rpm. direct connected to a General Electric generator rated at 1250 kw. and 1363 kva. This engine was equipped to operate on natural gas when installed and was the first engine so equipped to be put in operation in this country. The fourth Gas-Diesel installed in 1938, a Nordberg Air Injection Diesel, is a 6 cylinder, 21" x 29" unit, and rated at 2250 hp. at 225 rpm. and 2000 hp. on gas. It is connected to a General Electric generator having a V-belt driven exciter. The first three units are separately excited by means of Fairbanks-Morse motor-generator sets.

The fifth Nordberg Gas-Diesel installed in 1939 is a solid-injection Diesel on fuel oil, but equipped with an injection air compressor for natural gas. The engine is rated at 3200 hp. on oil and is a 21" x 29", 8 cylinder unit equipped with a Roots blower for scavenging. This engine has a General Electric alternator and V-belt driven exciter. The generator is rated at 2250 kw. at .8 pf. or 2812 kva. This engine shows slightly better fuel economy than the 8 cylinder, 17" x 25" engine, with greater cylinder output, due to experience gained and advance in design over the last several years. The power demand and plant output at Lubbock ranges from around 1,500,000 kwh. per month in the low month of February to around 1,800,000 kw. demand for the peak in August, or an average of nearly 20,000,000 kwh. per year. No city in Texas has experienced such a growth in population or such an accelerated kw. demand per capita in the last ten years. Moreover, no other Diesel plant on the Continent can produce electricity at such low cost as at Lubbock, Texas, the actual overall cost for production and distribution being below that of many steam plants. In view of the fact that natural gas is available in such an abundance and at such low cost, it is quite logical to expect that the entire plant load will be on natural gas in another year or two, further lowering the fuel cost.

When these engines were first installed to operate on gas, the rating was about 10 per cent below the Diesel rating on fuel oil. It is now observed that the last 3200 hp. engine develops the full fuel oil rating on natural gas, and indicates the greatest advance in this art yet made by Nordberg in this type of engine.

As would be quite naturally expected, the essential auxiliaries and adjuncts to operation have been installed. The fuel line for the

American Bosch pilot pumps has Nugent filters. The lube oil equipment comprises Schutte & Koerting shell and tube cooler, a Goulds filter, and a Mercoid oil pressure and temperature control. Each air intake is protected by a battery of air filter cells of the American adhesive impingement type, properly housed in concrete cells each equipped with air intake stacks extending some 25 feet above the street level, as shown in the view of the power plant building, thus preventing the dust from reaching the filters.

Alnor exhaust pyrometers are mounted at the forward end of the engines. Both Elgin and Permutit softeners for make up water are in the plant, the water cooling system consisting also of a Schutte & Koerting shell and tube cooler, a closed cooling system of the Schubert-Christy design, and Allis Chalmers cooling system control, Allis Chalmers cooling water circulating pumps, and Crane valves and fittings.

The switchboard is the standard General Electric prime mover board with engine and feeder panels, and General Electric instruments and regulators. The board is the dead front type with enclosed protection for the switchbear.

The building is constructed with a gallery or platform at the exhaust side of the building, with provisions for servicing the engine, the fuel tanks and the like. The plant is a semi-basement design, with the lubricating oil storage, and other equipment located below the engine room floor. Two new Schubert-Christy cooling towers have recently been installed to replace the cooling pond system, together with water softening equipment, thus assuring maximum protection against scale formation.

Each engine is fitted with a three stage air compressor, and when operating on gas, instead of compressing air as normally done when operating on oil, the gas is compressed. The gas is brought to the suction side of the compressor at about 50 lbs. gauge and discharged at approximately 1100 lbs. psi. into a gas bottle which is connected to the injection valves through a common header. From this header the gas is admitted to the individual cylinders through fuel injection nozzles which are equipped with variable lift needle valves. When operating on natural gas, it was found that a small quantity of fuel oil would be necessary to obtain smooth operation and uniform combustion. This small amount of fuel oil, referred to also as pilot oil, is injected with each charge of gas, this quantity of fuel oil being practically constant regardless of the load on the engine, hence the actual btu. input of fuel oil would vary with the load, being less for full load and more for lower loads per kw. generated.

Each cylinder is supplied with an individual American-Bosch fuel pump. When operating on oil as a Diesel engine, these pumps supply fuel to the injection valves in the normal manner. When the engine is changed over for natural gas, these same pumps are connected to operate a fuel valve actuator. These fuel pumps are then arranged to pump lubricating oil instead of fuel oil. The hydraulic valve actuator plunger is connected to the injection valve lever on the top of the cylinder head and thus lifts the needle valve to admit the natural gas from the high pressure headers.

The injection pumps, in turn, are connected to the governor in the usual manner so that the amount of oil delivered by the pump is in proportion to the engine load. Any change in the load sends more or less oil to the actuating plunger, which in turn, varies the lift of the needle valve and admits a greater or lesser quantity of gas to the cylinders. The oil line from the pump to the actuator is water jacketed so as to maintain a uniform oil temperature of the lubricating oil.

The pilot oil is delivered to the injection valve by means of an additional small American Bosch injection pump driven from the cam shaft and located adjacent to the regular pumps. The amount of pilot oil is a constant quantity for all load conditions, but the total quantity is a small amount, being about 5% of the total btu. of the fuel consumed at full load.

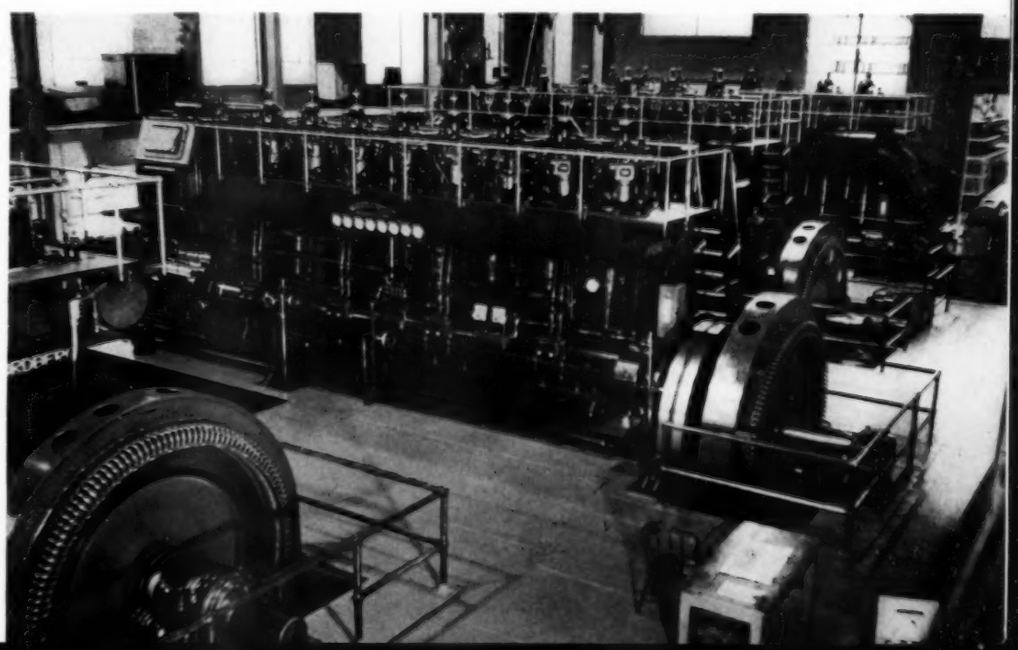
The peak load on the plant exceeds half the

This Nordberg air injection Diesel, installed in 1932, was changed over to gas fuel in 1939.

total capacity of the Nordberg engines, consequently for stand-by capacity, the plant is dependent upon the original and older plant comprising six Fairbanks-Morse engines totaling around 3,000 hp. which are housed in a separate building. At times during the early evening peak, as many as four of the large engines are on the line, and as many as three engines are on the line about 90 per cent of the time. The load factor and plant-capacity factor is therefore very high.

The city of Lubbock has a population estimated between 38,000 and 40,000 and a total of about 6325 consumers, 4875 of which are served by the municipal plant, while the others are connected to the private competitive utility serving this area, giving the city approximately 70% of the business. The total gross receipts of the municipal plant for light and power are nearing $400,000 annually, with a net profit exceeding 50 per cent of this gross, a truly remarkable showing, even for a Diesel-equipped municipal power plant.

General view of the last three Diesels installed at Lubbock.



PASCAGOULA

This Diesel tug has given 2½ years heavy duty service on less than $40 engine repair expense.

Two typical Diesel-engined Gulf tugs "Gloria Colle" and "Herman Colle," which ply between Galveston and Birmingham.

ALTHOUGH public interest usually centers about yachts and streamliners when Diesel engines are considered, there is no escaping the fact that the Diesel first proved itself as a dependable and economical source of power in heavy-duty, marine service, and that this unromantic but vitally important field owes much of its profitable expansion to the rugged, heavy-duty type of Diesel that the general public seldom sees. Accepted economies, both to operators and shippers, of heavy, bulk commodity transportation would be out of the question without the thousands of Diesel tugs now operating in river, Gulf and coastwise towing.

Perhaps in no other application are the basic characteristics of the Diesel so important: economy of fuel consumption, maintenance and personnel; "cold" starting ability for complete shut-down during stand-by periods; high torque to assure plenty of power at slow speeds; quick response for maneuverability; and maximum cruising range. Numerous shipyards, engaged in the construction of commercial craft, have recognized the advantages of such power qualities for many years with substantial benefits to their customers, and representative of these is F. B. Walker & Sons, of Pascagoula, Mississippi. This plant, located on deep water of the Pascagoula River (the "singing river" of Longfellow's verse), has been the cradle of many profitable vessels now operating throughout the bayous, rivers and Gulf of Mexico in a wide variety of towing assignments, from beer to gravel. A brief discussion of some of these tugs, selected at random, will serve to demonstrate the success of builders and owners with Diesels for this type of marine propulsion.

The tug *Normahal* is engaged in general towing between New Orleans and Texas ports. She is 59′ 6″ long, has a beam of 15′ 3″ with a 6′ draft. Power is supplied by a 6-cylinder Atlas Imperial Diesel, rated at 160 hp. at 300 rpm., and directly connected to a 58″ by 30″ Columbian propeller, which gives a speed of 10½ knots, running free. The engine is direct-reversible and carries a minimum of auxiliary equipment. The starting air compressor, fuel transfer pump, fuel and lubricating oil filters and lube oil cooler were supplied by the engine builder and are all engine-mounted. Other equipment include the Yale & Towne three-quarter ton hoist, an Alnor exhaust pyrometer, the customary switchboard, and a 32 volt auxiliary generating set. Two tanks provide fuel capacity of 1700 gallons and the fresh water tank holds 250 gallons.

Immediately after launching, the *Normahal* was placed in service, towing two 175 foot barges between New Orleans and Houston through the Intracoastal Canal, each barge loaded with 30,000 cases of beer making a total of 60,000 cases per trip. Towing time on this assignment averaged six days, with four days required for the return, or ten days for a round trip. After approximately a year of this service, the *Normahal* was dry-docked for general inspection but no repairs of any sort were required by the Diesel. In fact, Chief Engineer Guenard states that during two and one-half years of continuous, heavy-duty service the total engine repair expense has been less than $40.00. Such constant availability is typical of Diesel tugs and is one more reason for their wide acceptance in this type of work.

Another outstanding ship from the ways of F. B. Walker & Sons is the *Jay Gee*, owned by the Louisiana Materials Company of New Orleans. This Diesel tug has a surprising record of endurance and economy for towing sand, gravel and shell. An average assignment for the *Jay Gee* is towing three to five loaded barges through Lake Pontchartrain, thence down the Industrial Canal and into the Mississippi River. In addition to plenty of power, quick handling is essential for such service. Principal dimensions for the *Jay Gee* are: length 74′, beam 16′, and draft 7′ 6″.

A 275 hp. Atlas Diesel swings a 72″ Columbian propeller at 275 rpm on a 5″ diameter steel shaft. The Walker yard installs steel shafts with bronze bearings almost exclusively. Thus, any scoring from foreign materials occurs on the replaceable sleeves with no damage to the shaft proper. Auxiliary equipment is similar to that of the *Normahal* except for electrical galley refrigeration and an independent air

DIESEL TUGS

By DWIGHT ROBISON

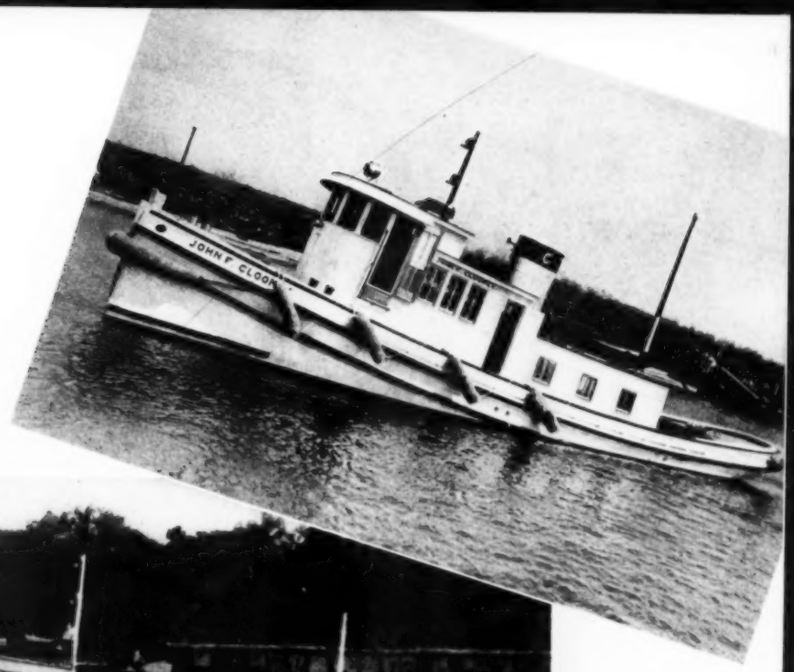
compressor driven from the 32 volt Atlas Atimco auxiliary generating set. With the 9,000 gallon fuel tanks filled to capacity, the boat is capable of 11 knots running free.

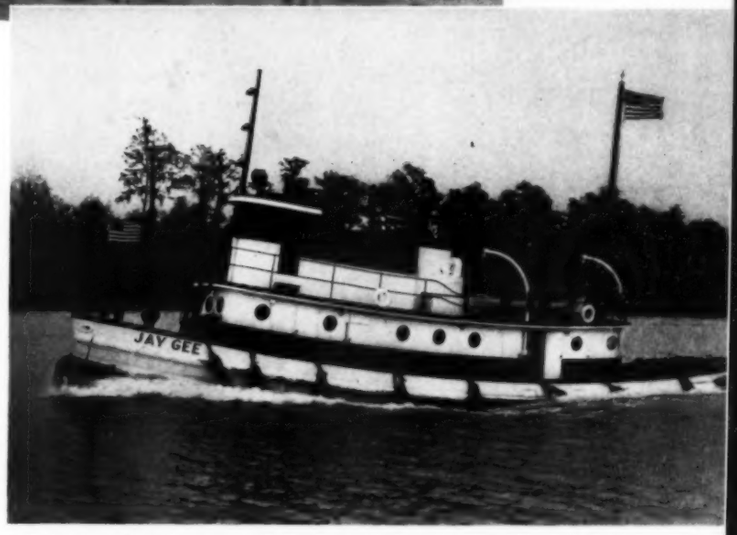
While the *Jay Gee* is towing barges, the husky little towboat *J. R. Ayres* is kept busy tending dredges for the same owner. Heavily timbered, as are all the Walker boats of wooden construction, she measures only 45′ in length but is far from a light-weight, as her service proves. Complete accommodations are provided for a crew of four and power is supplied by a 60 hp. Atlas Diesel turning at 600 rpm. and driving through a built-in reverse gear.

With further reference to wooden construction typical of Walker tugs, the *John F. Clooney* is an excellent example. This ship is built entirely of wood with frames of sawn cypress 7″ by 8″ on 16″ centers. Planking, also, is entirely of cypress, and the keel is a single length of 10″ by 14″ long leaf, yellow pine. It is unnecessary to comment upon the durability of such a hull, except that expert workmanship guarantees it as substantial and free from maintenance expense as the 275 hp. Diesel it carries. This engine is an exact duplicate of the one installed in the *Jay Gee* and has been in constant service since 1934, requiring only a minimum of routine maintenance.

No comments on towing in this section of the United States would be complete without reference to the low-cost transportation of lumber. In this service the Colle Towing Company of Pascagoula and New Orleans relies entirely upon Diesel economy and dependability. Although in the business of general towing, their tugs are mainly assigned to long strings of barges loaded with pulpwood for the various paper mills of this section, and are also responsible for the transportation of heavy, green piling and timbers to creosoting plants. Their fleet is entirely Walker-built and Atlas-powered, and consists of the 58′, 160 hp. *Gloria Colle*, the 64′, 200 hp. *Herman Colle* and the 64′, 200 hp., *John H. Colle*. All three of these tugs are constantly active between Galveston and Birmingham, Alabama. Their efficient and dependable service has earned for them an enviable reputation.

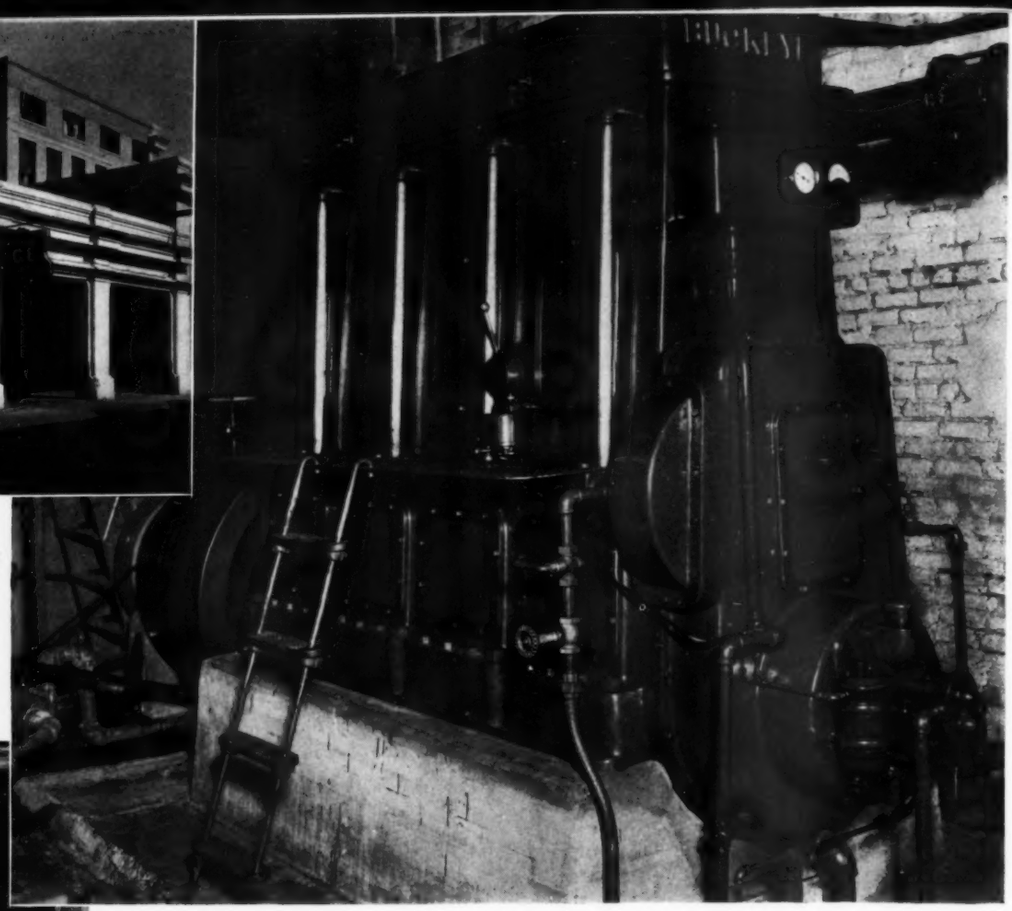
While this is a small cross-section of Southern towing activity, the diversity of application emphasizes the importance of marine Diesel characteristics. In this territory, with its high percentage of industrial centers located on navigable waterways, towing is particularly essential to economical production. In comparison with other types of propulsion, heavy-duty, marine Diesels have little or no competition in this type of service. There is no lost time firing up in the morning and no waste of fuel while standing by or waiting for a tow. Cruising range without refueling or taking fresh water is ample for all requirements without excessively large boats at correspondingly higher costs, both in construction and maintenance. The limited personnel necessary for satisfactory operation results in substantial savings to shippers as well as to owners, yet dependability and availability have long since been proven beyond question. F. B. Walker & Sons may well be proud of their shipbuilding record as evidenced by these representative examples. They are to be congratulated upon their long-standing appreciation of Diesel possibilities in heavy-duty marine service.





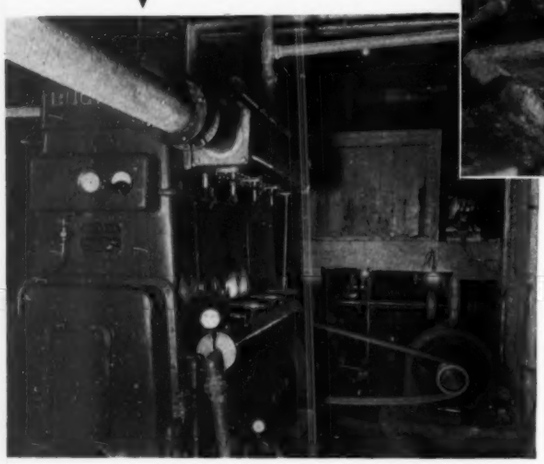
The tug "John F. Clooney," top view, powered with a 275 hp. Diesel, has been in service six years. The "J. R. Ayers," middle view, carries a 60 hp. Diesel and is used to shift empty barges. The 275 hp. Diesel tug "Jay Gee," shown right, handles three to five loaded barges through Lake Pontchartrain and the industrial canal, into the Mississippi River.

Mr. J. Di Carlo, president of the Panama Ice Company.



View of the Buckeye Diesel showing the Silent Watchman just above the catwalk; note Nugent lube oil filter lower right.

Exhaust side of the Diesel showing the Alnor pyrometer.



PANAMA ICE DIESELIZES

By WARREN GLEASON

THE slogan, "We Never Close," on the electric sign of the Panama Ice Company, 535 Chartres Street, New Orleans, is suggestive of the type of service which an up-to-the-minute ice manufacturer must render to his patrons, and likewise is significant of the unfailing efficiency such a manufacturer must require of his power sources. According to Mr. J. Di Carlo, president and manager of the company which has occupied the same location since its organization in 1912, his power worries ceased with the installation of a Diesel.

The original power plant was steam-driven and gave good service for many years. To reduce expense of fuel and personnel, a change was ultimately made to a natural gas engine of a popular industrial type. Over a period of time, however, this engine failed to perform up to requirements; twenty-four hour operation was simply too rigorous a demand; time was lost in shut-downs for overhaul and repairs, and a concern selling ice in a hot climate cannot ask its customers to wait. A Diesel engine was consequently selected, the installation being made in June, 1939.

The engine is a Buckeye Diesel, the sale being made through New Orleans Electric Engineering, Buckeye distributors. This is a four cylinder engine, Model E, developing 150 hp. at 400 rpm., supplying all the power for the plant, handling both belt-driven and generator-driven equipment. The crankshaft is of 6" diameter. Fitted to the crankshaft is a 48" flywheel and on the outboard shaft a plain 42" x 15" face pulley drives the ammonia compressor through a 14" leather belt. There is also a 32" "V" sheave which drives the 30 KW generator. This generator supplies current for all lighting purposes as well as for a number of auxiliary motors.

Accessory equipment on the Diesel includes a 2" Fairbanks-Morse fuel oil transfer pump, a Curtis air compressor of 200 lbs. pressure, a Nugent lube oil filter, an Alnor exhaust pyrometer and the Buckeye Silent Watchman.

This latter device commends itself especially to engine rooms operated with limited personnel; through its services, the motor is automatically and immediately stopped upon shortage or failure of either lubricating oil or cooling water; and neither can the motor be started again until the defective situation has been corrected. A Maxim silencer effectively handles the exhaust.

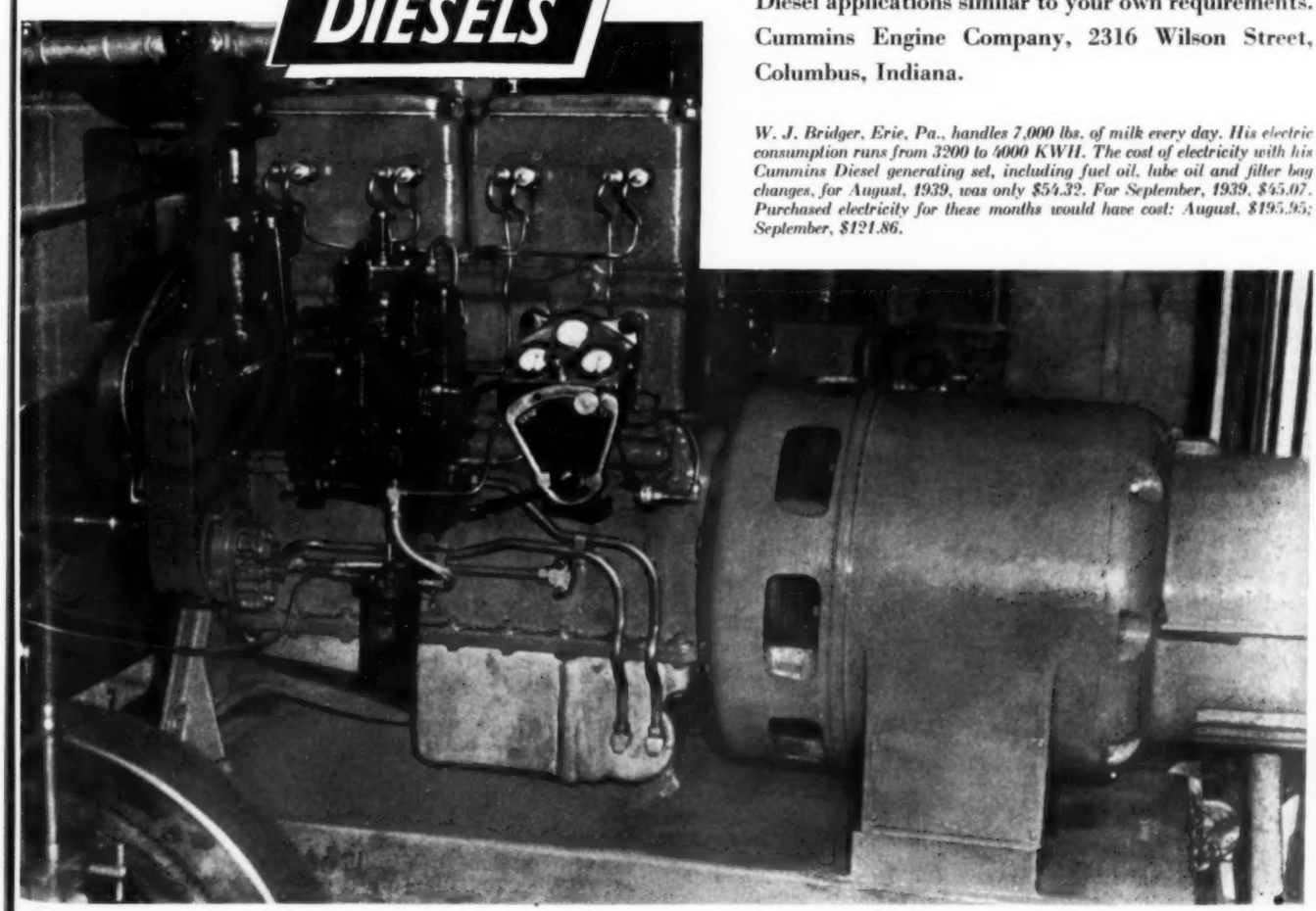
The only shutdowns in the past year have been for changing oil every sixty days. Aside from these, this Diesel has operated twenty-four hours per day every day in the week. The daily production is fifty tons of ice.

Dairy saves 2/3 on its power bill with Cummins Diesel Generating Set

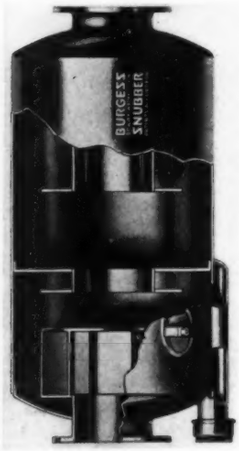
The Job You Want Done Is *Now* Being Done with CUMMINS Dependable DIESELS

● A Cummins Diesel Generating Set is always "ready to serve" . . . instant starting makes the power immediately available. The engine's simple service requirements eliminate the need for a maintenance engineer or any expert mechanical help. On intermittent service or continuous duty, a Cummins Diesel generating set delivers uniform electric current at the lowest KWH cost. That's why large dairies like the Borden Company and the smaller independents, both find profit in Cummins Diesel generating sets. Ask for "case studies" on a variety of Cummins Diesel applications similar to your own requirements. Cummins Engine Company, 2316 Wilson Street, Columbus, Indiana.

W. J. Bridger, Erie, Pa., handles 7,000 lbs. of milk every day. His electric consumption runs from 3200 to 4000 KWH. The cost of electricity with his Cummins Diesel generating set, including fuel oil, lube oil and filter bag changes, for August, 1939, was only $54.32. For September, 1939, $45.07. Purchased electricity for these months would have cost: August, $195.95; September, $121.86.



NEW SPARK-ARRESTER SNUBBER ANNOUNCED BY BURGESS



A NEW Spark-Arrester Snubber, known as the Burgess SDM Series Snubber, for quieting exhausts of marine engines, has just been announced by the Burgess Battery Company, 500 W. Huron Street, Chicago. Besides preventing exhaust noise, it has a special internal design which keeps solid matter, such as soot, ash, and flying sparks, from reaching the atmosphere.

The internal circuit of the gases in the new Burgess SDM Series Snubber is so arranged that flying sparks and other solid particles are diverted into a carbon trap by centrifugal action as the fast moving slugs of exhaust gas enter the Snubber. This centrifugal action also breaks up the slugs, whirling them into the final snubbing stage, where they are snubbed to a smooth flow. The resulting stream of gas passes on to the atmosphere without pulsation or noise. Back pressure is low because a low impedance path is provided for slow speed gases.

The Burgess SDM Series Snubber is mounted in a vertical position, with large hand hole at the bottom for removing accumulations of carbon. The Snubber may be obtained in 19 standard sizes ranging from 1 inch to 32 inches.

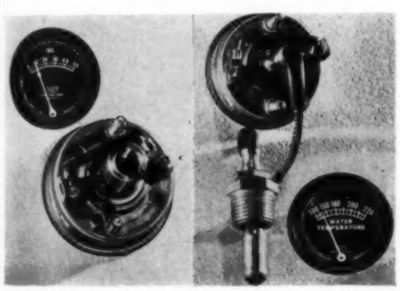
NEW WAUKESHA CATALOG

A NEW and unique type of catalog has just been issued by the Waukesha Motor Company describing the Waukesha Multi-Fuel engine which burns all gaseous and liquid fuels. This catalog, produced under the methods devised by X-Ray Sales Method, Inc., is a combination

of transparencies and colored sections which make it very easy for the reader to understand how this engine is constructed and how it operates under varying field conditions and with various fuels. This is a unique and very valuable book which we highly recommend to our readers. Copies may be obtained direct from The Waukesha Motor Company, Waukesha, Wisconsin. Just ask for Form 1189.

A NEW LINE OF COMBINATION PRESSURE AND TEMPERATURE INDICATORS, CUT OUT AND/OR ALARM SWITCHES

A NEW line of lube oil pressure gauges and water temperature indicators has been developed by the Rochester Manufacturing Company. In addition to the usual indicating dials, these instruments incorporate electrical contacts for actuating relays to engine stops and to flash a light or sound an alarm signal.



Both instruments incorporate the Rochester heavy duty movements which are enclosed in one piece drawn steel cases with sealed bezels. This construction renders the gauges impervious to dust and moisture. Readers of DIESEL PROGRESS, who are interested, may secure complete information on these instruments by writing the Rochester Manufacturing Company, Inc., Rochester, New York.

EXHIBITION RUNS BY LATEST ZEPHYR EARN $1.98 PER MILE

WHEN will public interest in streamline trains reach its peak?

This question is the logical sequence to the announcement made on statistics in conjunc-

tion with the pre-service trips of the Burlington's 10th Zephyr—the "Silver Streak"—now in round trip daily operation from Lincoln to Kansas City via Omaha.

Gross earning for this new train on exhibition runs over a period of twenty-six days is revealed at $1.98 per mile which would be a gratifying return for any passenger train in regular service. This interesting fact is the highlight of a statement issued by Albert Cotsworth, passenger traffic manager of the Burlington.

"We had the new stainless steel Diesel flyer for approximately 30 days prior to its christening," said Mr. Cotsworth. "There were only four idle days out of that total. Three of these were during Holy Week. On these 26 days it carried 7,752 adults and 1,604 children, a total of 9,356 passengers for a total revenue of $14,261, an average of 360 passengers and $548.50 per day. It traveled 7,216 miles in service and the average revenue for all of these excursions was $1.98 per mile.

"Of the 9,356 passengers carried, 6,518 or 70% made a round trip without getting off the train, and of this latter number 1,517 or 23% were children of half fare age."

The Burlington Lines will speed up their Texas-Colorado service with reductions of more than 5 hours' running time between Dallas, Fort Worth and Pueblo, Colorado Springs and Denver. Four thousand horsepower Diesel locomotives will be used in this over-night operation as a substitute for steam. By mid-summer these trains, with the inclusion of new equipment, will be full-fledged "Zephyrs"—the 11th and 12th in the Burlington fleet.

In addition to Diesel units on the ten current Zephyrs and the coming Texas Zephyrs, similar type locomotives are now taking the "Exposition Flyer" from Chicago to Denver in both directions and the "Fast Mail" between Chicago and Galesburg.

Here is a summary of this relatively new power application in passenger service on the Burlington as of June 2:

	Miles per day
Ten current Zephyrs	7,013
Exposition Flyers, Chicago to Denver, overnight in both directions	2,073
Fast Mail, between Chicago and Galesburg	324
Advance Texas Zephyrs	1,668
Total Diesel miles per day	10,978

With the advent of the "Advance Texas Zephyrs," 70 of the nation's most famous passenger trains will have been Dieselized.

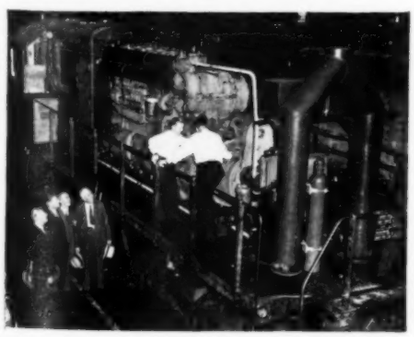
HARRY J. SWANSON, vice president and treasurer of Ottawa Steel Products Inc., of Grand Haven, Michigan since 1924 has sold his interest and resigned effective June 1, 1940.

RECENT CATERPILLAR MARINE INSTALLATIONS

Fifteen 15-kilowatt Diesel electric sets have been ordered from Caterpillar Tractor Company by Bethlehem Steel Shipbuilding Company for installation as emergency auxiliary power units in the Cl 6,750 gross ton passenger and cargo ships now abuilding for the Maritime Commission.

Other recent and interesting marine installations of Caterpillar Diesel engines for the U. S. government are six V-8 units installed in pairs as main propulsion engines for three U. S. Navy survey vessels and seven 100-horsepower Diesel marine engines to the U. S. Engineers for installation in 40-foot tugboats. Two of these latter will be at Washington, D. C., one at Omaha, Nebraska, two at Kansas City, and two at Charleston, South Carolina.

NEW 1,000 HP. DIESEL-ELECTRIC LOCOMOTIVE



Officials of General Electric and the American Locomotive companies recently inspected the Diesel-electric equipment of the new 1,000-horsepower locomotive built jointly by the two companies. The locomotive with hood removed exposing the Alco Diesel is shown in the accompanying photograph. The gentlemen are: on the runway, P. T. Egbert, manager of Diesel sales for Alco, right, and Guy P. Wilson, manager of transportation for General Electric. On the floor, left to right are: William C. Dickerman, chairman of the board; Duncan W. Fraser, president; R. B. McColl, vice president.

MORE ABOUT THE AMERICAN BOSCH DIESEL SCHOOL

One of the interesting features resulting from the increased use of the Diesel engine is the apparent willingness of the builders of this type of equipment to do everything possible to assure its successful field operation. As an example of this far-seeing type of merchandising, the American Bosch Corporation has established at its plant in Springfield, Mass., one of the most unique schools in this country. In fact it is one of the very few in the world operating under such sponsorship.

As is generally recognized, the fuel injection system is literally the heart of the Diesel engine and like the human heart, its mechanism must function with remarkable precision. For example, the fuel injection system must force fuel oil into the engine cylinder in the form of finely atomized spray against compression pressures of five or six hundred pounds per square inch. And in doing this, it must measure a definite amount of fuel oil and force it into the engine cylinder within a given time—at a precise moment. The entire cycle must occur with the rapidity and accuracy with which the spark occurs in your automobile.

The school building at the American Bosch plant in Springfield, Mass.

American Bosch established its school in order to provide an authoritative source of information on the operation, application and maintenance of the fuel injection equipment it supplies. The course is open to anyone definitely connected with the Diesel industry whether he be an engine manufacturer's technician, a school instructor, or the operator of Diesel-powered equipment such as a tractor, a truck or a stationary or marine power plant. There is no charge in connection with the school and those attending need only defray their travelling and living expenses.

A group of students working on one of the two modern dynamometers which are available for school use.

NEW R.E.A. PLANS

Rural Electrification Administrator Harry Slattery recently announced telegraphic approval of the purchase of eight fully mobile generating plants, to provide electric power for four REA-financed distribution systems. Five of these units will be installed by two Virginia Cooperatives whose lines are nearly ready for energiza-

tion, and three by two Oregon Cooperatives whose construction is just starting.

A similar mobile plant recently went into the service of the Jo-Carroll Electric Cooperative at Elizabeth, Illinois, after successfully meeting all performance tests. Like the new ones just ordered, this plant carries twenty-four hours' fuel supply, and it can be attached quickly to a substation, and larger fuel tanks provided. It is almost automatic in operation, requiring little beyond watching and oiling.

The Community Electric Cooperative with headquarters at Suffolk, Va., ordered three of these plants having two 60 kw. units each, and the Prince George Electric Cooperative of Disputanta, Va., ordered two having two 50 kw. units, or 100 kw., for each trailer. In a message to the members of these cooperatives yesterday, when telegraphic bids for the generating equipment were under consideration, REA said:

"This action is necessary because the Virginia Electric and Power Company has failed to quote a wholesale rate sufficiently low to make your distribution systems economically feasible. . . . We believe we are safe in saying that your lines which have been built may be energized by mid-summer. The entire strength of our organization is being thrown behind efforts to cut down even this short time."

The eighth mobile generator is ordered by the Jordan Valley Electric Cooperative of Jordan Valley, Oregon. This community has had no power available. REA has agreed to lend the cooperative $30,000, of which $12,000 is for the generating plant and $18,000 for building 4.5 miles of line to serve 81 members.

S.K.F. EXPANDS

S.K.F. Industries has recently purchased the John Carey Watson factory so familiar to passengers on the Pennsylvania Railroad. This plant will materially increase the capacity of S.K.F. Industries, Inc., Philadelphia, in the production of more than 6000 types and sizes of ball and roller bearings—it is one of the most modern plants in Philadelphia, located on the Pennsylvania Railroad at Bridge Street, and becomes the third of S.K.F.'s Philadelphia factories.

The one-story, saw-tooth, daylight type building contains 226,000 square feet of floor space on a plot of 15 acres of beautifully-landscaped lawns, and will be devoted exclusively to the manufacture of antifriction bearings.

Executive, sales, and sales engineering offices will remain at Plant No. 1 at Front Street and Erie Avenue, site of the old Hess-Bright Manufacturing Company which was founded in 1904. Here, wing after wing has been added until practically all of the available manufacturing space has been utilized.

ANNOUNCEMENT

IN order to more closely identify the De La Vergne Engine Company with The Baldwin Locomotive Works of which it is a wholly owned subsidiary, the name De La Vergne Engine Company has been changed to BALDWIN DE LA VERGNE SALES CORPORATION.

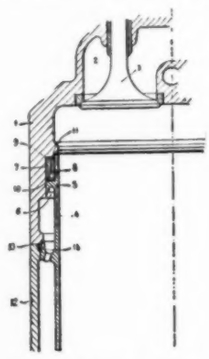
This is a change of name only and in no wise will affect the management, personnel or operation of the Company, which, under the name of BALDWIN DE LA VERGNE SALES CORPORATION, will continue as in the past.

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

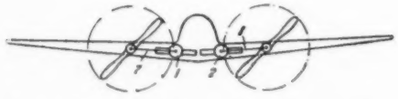
Conducted by C. CALVERT HINES*

2,170,443
MOUNTING OF CYLINDERS IN MOTORS
Marius Jean-Baptiste Barbarou, Neuilly-sur-Seine, France
Application July 8, 1937, Serial No. 152,589
In France September 9, 1936
3 Claims. (Cl. 123—173)



3. In an internal combustion engine having a cylinder liner and cylinder head, an annular inwardly directed ledge on the head, an annular circumferentially projecting ledge on the liner, said ledges being spaced apart to form a space therebetween, a pair of concentric conical rings located in said space with their slanting faces in contact and their larger cross-sectional ends seated on the ledges, the narrower ends of the conical rings spaced from the opposite ledge to permit play, and means for clamping the head in operative position, whereby the wedging action of the rings between liner and head effectively effects a sealing action therebetween.

2,170,003
ENGINE ARRANGEMENT IN AIRCRAFT
Walter Blume, Brandenburg-on-the-Havel, Germany, assignor of one-half to Arado Flugzeugwerke Gesellschaft mit beschränkter Haftung, Brandenburg-on-the-Havel, Germany
Application December 23, 1938, Serial No. 247,518
In Germany January 6, 1938
5 Claims. (Cl. 244—55)



1. In an aeroplane, the combination of a fuselage, supporting wings having roots joined to said fuselage, air-screws mounted exteriorly of said fuselage, engines each comprising at least two cylinders and a crank shaft common to said cylinders, each of said engines being arranged partly within said fuselage and partly within a supporting wing, and transmission mechanism coupling said shafts to said air-screws.

* Patent Attorney, 811 E. Street, N.W., Washington, D.C.

2,170,020

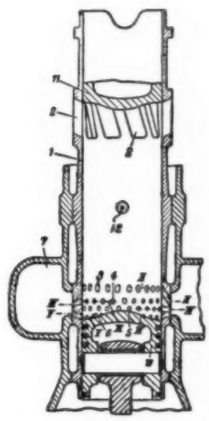
INTERNAL COMBUSTION ENGINE

Manfred Gerlach, Aken-on-the-Elbe, Germany, assignor to Junker Flugzeub- und-Motorenwerke Aktiengesellschaft, Dessau, Germany

Application September 27, 1937, Serial No. 165,869

In Germany September 30, 1936

5 Claims. (Cl. 123—51)



4. In an internal combustion engine having a cylinder, a piston movable in said cylinder, and exhaust ports located at one end of said cylinder; a plurality of rows of inlet ports arranged at the other end of said cylinder, said rows of inlet ports being spaced from each other in a direction longitudinally of said cylinder, a first row of said inlet ports having the axes of said ports inclined with respect to the longitudinal axis of said cylinder to direct inlet gas toward said exhaust ports and further inclined with respect to the radii of the plane of the circle in which said first row lies to direct inlet gas in a first path adjacent and parallel the inner wall of said cylinder, a second row of said inlet ports having the axis of said ports each inclined with respect to said longitudinal axis at an angle greater than the inclination of the axes of said first row of ports, said axes of said second row of ports being further inclined to direct said inlet gases in a second path adjacent and parallel to said first path, and at least a third row of said inlet ports having the axis of each port inclined with respect to said longitudinal axis at an angle greater than the inclination of the axis of said second row of ports, and further inclined to direct inlet gas in at least a third path lying inwardly of and parallel to said second path.

2,168,829

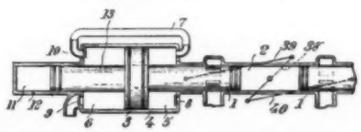
FREE PISTON MACHINE

Raul Pateras Pescara, Paris, France

Application July 14, 1937, Serial No. 153,648

In France July 17, 1936

17 Claims. (Cl. 230—56)



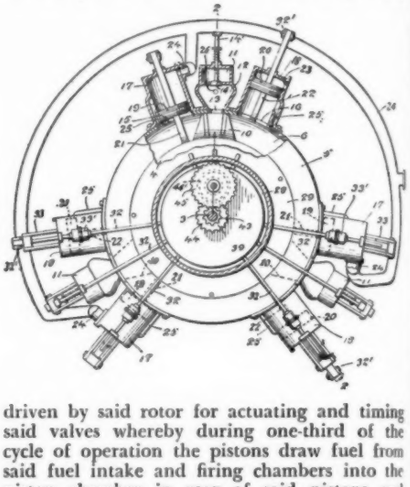
1. A free piston motor compressor unit comprising in combination, a motor cylinder, at least one motor piston adapted to slide freely in said motor cylinder, compression means comprising at least one compression cylinder and one compression piston operatively connected to said motor piston, said compression means forming a precompression chamber and a

main compression chamber, the compression ratio in the precompression chamber being a fraction of the compression ratio in the main compression chamber, valve means for admitting air in the precompression chamber, one-way valve means for connecting the precompression chamber with the main compression chamber, said last valve means being operable by pressure in the precompression chamber to open communication with the main compression chamber and means for discharging the compressed air out of said main compression chamber.

2,170,366
ROTARY INTERNAL COMBUSTION MOTOR

Julio Correa Dominguez, Tocopilla, Chile
Application June 2, 1937, Serial No. 146,081
1 Claim. (Cl. 123—14)

A rotary internal combustion engine comprising a stator including a piston chamber, a rotor operating in said stator, pistons on said rotor and operating in the chamber, combined fuel intake and firing chambers in communication with said piston chamber, ignition means in said combined fuel intake and firing chambers, valves for controlling said combined fuel intake and firing chambers, exhaust and air valve housings in communication with the piston chamber adjacent the combined fuel intake and firing chambers and each having a port open to the atmosphere and a bypass communicating with the piston chamber, valves operating in said housings for opening and closing the bypasses to said ports and closing said housings to said piston chamber, abutments carried by the latter-named valves for movement into and out of the piston chamber, and a timing means



driven by said rotor for actuating and timing said valves whereby during one-third of the cycle of operation the pistons draw fuel from said fuel intake and firing chambers into the piston chamber in rear of said pistons and simultaneously said pistons scavenge exhaust gases from in advance thereof to the atmosphere by way of the bypasses and the ports of the exhaust housings and during the second third of the cycle of operation to compress the fuel between the pistons and the abutments of the valves of the air housings and simultaneously draw into the piston chamber cooling air in rear of said pistons by way of the bypasses and ports of the air housings and during the last third of the cycle to fire and expand the compressed fuel for driving the pistons and simultaneously exhaust to the atmosphere the cooling air by way of the bypasses and the ports of the exhaust housings.

DIESEL PROGRESS

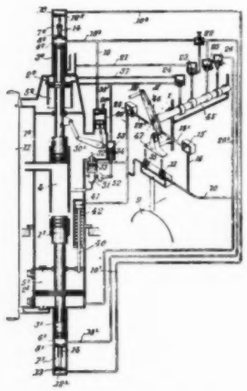
2,168,828

STARTING MEANS FOR FREE PISTON MOTOR COMPRESSORS

Raul Pateras Pescara, Paris, France, assignor to Société d'Etudes et de Participations, Eau, Gaz, Electricite, Energie, S. A., Geneva, Switzerland

Application July 11, 1936, Serial No. 90,237
In Belgium July 15, 1935

21 Claims. (Cl. 230—56)



1. In a free piston internal combustion engine compressor, having at least one accumulator which serves for stabilizing the engine, means for blowing compressed air into said accumulator to start the engine, and means mechanically connected to and actuated by said free piston for gradually lowering the mean pressure in this accumulator to the normal pressure during the transition period to normal operation.

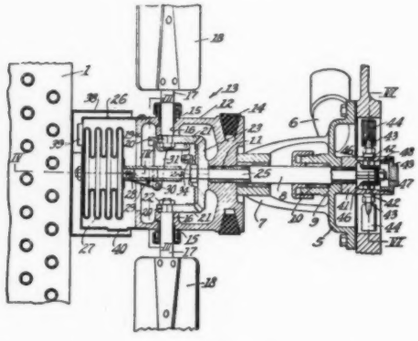
2,169,121

MOTOR COOLING SYSTEM

Dorhl H. Coy, Jackson, Ohio

Application October 4, 1937, Serial No. 167,179

6 Claims. (Cl. 123—174)



4. A combined air circulating fan and water impeller for engine cooling systems comprising a rotably mounted tubular shaft, a fan hub secured to one end of said shaft, an impeller body secured to the opposite end of said shaft, a plurality of fan blades pivotally mounted in connection with said hub, a thermostat supported by said hub, a second shaft extending through said tubular shaft, gear means carried at opposite ends of said second shaft, means for rotating said second shaft in response to movement on the part of said thermostat, vanes pivotally mounted on said impeller body, pinions connecting said fan blades and said vanes with the corresponding gears on said second shaft, and means for conducting air from the lower portion of the radiator for said engine to the vincinity of said thermostat.